United States
Department of
Agriculture
Forest
Service

Biological Evaluation
Resource Report

Fourmile
Management Project

Eagle River-Florence RD
Chequamegon-Nicolet National Forest

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Table of Contents

Tables

Figures

Introduction

The purpose of Biological Evaluations (BE) is to "review all USDA Forest Service planned, funded, and executed, or permitted programs and activities for possible effects on endangered, threatened, proposed, or sensitive species" (FSM 2672.4).

"Endangered" (E), "threatened" (T), and "proposed" (P) refer to those species covered by the Federal Endangered Species Act (19 USC 1536(c), 50 CFR 402.12(f) and 402.14(c) and listed by the USDI Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

"Sensitive" species include "those plant and animal species identified by a Regional Forester for which population viability is a concern" (Forest Service Manual [FSM] 2670.5). The Forest Service (FS) is responsible for protecting all federally proposed and listed species and the Regional Forester Sensitive Species (RFSS). In addition, the Forest Service is directed to "assist states in achieving their goals for conservation of endemic species" (FSM 2670.32). State-listed species are not addressed in the project environmental assessment, BE or BA, unless they are also considered a RFSS, in which case they will be discussed in the BE with findings summarized in the environmental impact statement or environmental assessment as appropriate.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan (Forest Plan)

The Chequamegon-Nicolet National Forest Land and Resource Management Plan (LRMP) provides standards and guidelines for protecting and managing forest resources that includes Federal Threatened and Endangered Species (TES) and RFSS.

- LRMP Standards and Guidelines – See TES and RFSS individual analysis for pertinent standards and guidelines and supplemental management direction

Federal Law

Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to "… implement a program to conserve fish, wildlife, and plants . . . to insure their actions do not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat." The National Forest Management Act (NFMA) requires national forests to maintain viable populations of "native and desired nonnative vertebrate species… well distributed in the planning area."

Secretary of Agriculture's Policy on Fish and Wildlife

The Secretary of Agriculture's Policy on Fish and Wildlife (9500-4) directs the Forest Service to "manage habitats for all native and desired nonnative plants, fish and wildlife species to maintain viable populations of each species; identify and recover threatened and endangered plant and animal species" and to avoid actions "which may cause species to become threatened or endangered."

Forest Service Sensitive Species Policy

Forest Service Sensitive Species Policy (FSM 2670.32) calls national forests to assist states in achieving conservation goals for endemic species; complete biological evaluations of programs and activities; avoid and minimize impacts to species with viability concerns; analyze significance of adverse effects on populations or habitat; and coordinate with states, USFWS and NMFS. The Forest Service Manual (2670.5) further defines sensitive species as those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trend in numbers, density or habitat capability that would reduce a species' existing distribution.

Endangered, threatened, and sensitive species are treated differently than other species. While most species are provided for by managing diverse habitats, endangered, threatened, and sensitive species require specific biological evaluations disclosing the effects of management activities on National Forest system land. Conservation measures are incorporated into project designs to protect these species, and the adverse effects of management activities are either eliminated or mitigated.

Many of the species that are on the RFSS list have viability concerns for the following reasons:

- Loss or degradation of suitable habitat (for both terrestrial and aquatic species)
- The species is at the edge of its range
- Little is known about the species and prudence dictates that the species be protected until more is known about the viability of the species
- Excessive harvest/exploitation or persecution
- Disease or interactions with non-native species
- Combination of the aforementioned factors

This BE will be reviewed upon obtaining any new information or species locations in the project area prior to or during completion of the project. The effects analyses and determinations will be reviewed and potential design features identified if necessary to protect new locations or populations.

Consultation History with US Fish and Wildlife Service

The 2015 Biological Opinion (BO) for Activities Affecting the Northern Long-Eared Bat (NLEB) on Eastern Region National Forests, found that depending on project-specific details and conservation measures, a large fraction of Forest Service (FS) activities evaluated programmatically in the BO are likely excepted from the take prohibitions at 50 CFR Chapter 17 under the ESA section 4(d) rule adopted for the NLEB with the listing decision. Take that is incidental to and not intended as part of the 4(d)-excepted activities does not require special exemption through compliance with the terms and conditions of an incidental take statement. Therefore, the incidental take statement with the 2015 Eastern Region BO for this programmatic action specifies:

1. A process for FS documentation of its determination that a proposed activity addressed in this BO is an excepted activity under the NLEB 4(d) rule, and if so, may rely upon the findings of this BO to document its compliance with section 7(a)(2) of the ESA with respect to the NLEB; and
2. Procedures for identifying projects that would require further consultation to obtain the necessary special exemption for anticipated taking that is not excepted by the 4(d) rule.

Reasonable and Prudent Measure for the 2015 Eastern Region BO, included the following:

Project-level consultation to obtain terms and conditions necessary to minimize the impacts of incidental taking. The FS will request project level consultation with the US Fish and Wildlife Service (Service) Field Office for timber harvest, prescribed burning, roads, trails, and habitat improvement/non-timber clearing projects when such projects may affect the NLEB and are:

- Proposed in areas that are partially or wholly within 0.25-mile radius of known, occupied NLEB hibernacula;
- Proposed in areas that are partially or wholly within 0.25-mile radius of known, occupied NLEB maternity roost trees during the pup season; or
- Otherwise not consistent with the definitions for activities that are excepted from taking prohibitions under the NLEB 4(d) rule.

Project level documentation that an activity is excepted from incidental take prohibitions and does not require terms and conditions. The FS will provide written documentation to the Service Field Office when it determines that timber harvest, prescribed burning, roads, trails, and habitat improvements/non-timber clearing projects may affect the NLEB, but that take resulting from such projects is excepted from take prohibitions applicable to the NLEB.

Documentation of excepted activities must be submitted to the Service Field Office at least 30 days in advance of signing a decision for timber harvest, prescribed burning, roads, trails or habitat improvement/

non-timber clearing projects that may affect (i.e. not likely to adversely affect or likely to adversely affect) the NLEB (USDI Fish and Wildlife Service, 2014).

State and Local Law

Wisconsin State-listed species are not addressed in the project BE unless they are also federally-listed or considered RFSS.

Topics and Issues Addressed in This Analysis

Purpose and Need

The FS is responsible for disclosing the effects of its actions on TES and RFSS where they occur within National Forest boundaries. Table 1 provides a list of all species considered in this evaluation and include their global ranking or "status" and "occurrence or habitat potential". Species identified in Table 2 are species currently listed as "likely to occur" (LRFSS), and are known to occur in Region 9, but have not been documented in the Chequamegon-Nicolet National Forest (CNNF). Considering range and habitat, these species could potentially be found in the CNNF.

The species-by-species determination of expected impacts for each alternative is shown in Table 1. The species listed in Table 1 and Table 2 are currently on the RFSS per the 2017 revision.

Table 1. Species considered: threatened, endangered, and RFSS.

Species	Common Name	Status	Occurrence / Hab. Potential	Evaluated in Detail
TES				
Bombus affinis	Rusty Patched Bumble Bee	G1, S1, SC, FE	N	Y
Canis lupis	Gray (Timber) Wolf	G4, S2, ST	C	Y
Charadrius melodus	Piping plover	G3, S1, SE, FE	N	N
Dendroica kirtlandii	Kirtland's warbler	G1, SNA, SC, FE	N	N
Lynx canadensis	Canada lynx	G5, SNA, SC	N	N
Lycaeides melissa samuelis	Karner blue butterfly	G5, S2S3, SC, FE	N	N
Myotis septentrionalis	Northern Myotis	G4, S1S3, ST	P	Y
Oxytropis campestris var. chartacea	Fassett's locoweed	G5T1T2, S1S2, SE	N	N
RFSS - Animals				
Acipenser fulvescens	Lake Sturgeon	G3G4, S3, SC	N	N
Ammodramus leconteii	Le Conte's Sparrow	G4, S2B, SC	N	N
Bartramia longicauda	Upland Sandpiper	G5, S2B, SC	N	N
Buteo lineatus	Red-shouldered Hawk	G5, S3S4B, ST	P	Y
Callophrys henrici	Henry's Elfin	G5, S2, SC	N	N
Danaus plexippus	Monarch Butterfly	G4, SU	P	N
Dendroica cerulea	Cerulean Warbler	G4, S2S3B, ST	N	N
Eptesicus fuscus	Big Brown Bat	G5, S2S4, ST	C	Y
Falcipennis canadensis	Spruce Grouse	G5, S1S2B, ST	C	Y
Glyptemys insculpta	Wood Turtle	G4, S3, ST	P	Y
Gomphus viridifrons	Green-faced Clubtail	G3, S3, SC	N	N
Haliaeetus leucocephalus	Bald Eagle	G4, S3B, SC	C	Y
Martes americana	American Marten	G5, S3, SE	C	Y
Moxostoma valenciennesi	Greater Redhorse	G4, S2S3, ST	N	N
Myotis lucifugus	Little Brown Myotis	G5, S2S4, ST	C	Y
Notropis anogenus	Pugnose Shiner	G3, S2S3, ST	N	N
Oeneis chryxus	Chryxus Arctic	G5, S2, SC	N	N
Ophiogomphus anomalus	Extra-striped Snaketail	G3, S1, SE	N	N
Ophiogomphus howei	Pygmy Snaketail	G3, S3, ST	N	N
Oporornis agilis	Connecticut Warbler	G4, S3B, SC	P	Y
Perimyotis subflavus	Tri-colored Bat	G5, S1S3, ST	P	Y
Picoides arcticus	Black-backed Woodpecker	G5, S2B, SC	P	Y
Pieris virginiensis	West Virginia White	G3G4, S2, SC	P	Y
Plebejus idas nabokovi	Northern (Nabokov's) Blue	G5, S1, SE	N	N
Tympanuchus phasianellus	Sharp-tailed Grouse	G4, S2B, SC	N	N
Venustaconcha ellipsiformis	Ellipse	G3G4, S2, ST	N	N

Species	Common Name	Status	Occurrence / Hab. Potential	Evaluated in Detail
RFSS – Plants				
Amerorchis rotundifolia	roundleaf orchid	G5, S1S2, ST	C	N
Arabis missouriensis	green rockcress	G5, S2, SC	N	N
Asplenium trichomanes-ramosum	green spleenwort	G4, S1, SE	N	N
Astragalus alpinus	alpine milkvetch	G5, S1, SE	N	N
Botrychium minganense	Mingan moonwort	G5, S2, SC	P	N
Botrychium mormo	little goblin moonwort	G3, S1S2, SE	C	Y
Botrychium oneidense	bluntlobe grapefern	G4, S2, SC	C	Y
Botrychium pallidum	pale moonwort	G3, S1, SC	N	N
Botrychium rugulosum	ternate grapefern	G3, S2, SC	C	Y
Callitriche hermaphroditica	northern water-starwort	G5, S2, SC	N	N
Callitriche heterophylla	twoheaded water-starwort	G5, S1, ST	N	N
Caloplaca parvula	a lichen	G1	N	N
Calypso bulbosa	fairy slipper	G5, S2, ST	C	N
Carex backii	Back's sedge	G5, S1, SC	N	N
Carex livida var radicaulis	livid sedge	G5, S2, SC	N	N
Carex michauxiana	Michaux's sedge	G5, S2, ST	N	N
Carex sychnocephala	manyhead sedge	G5, S2, SC	N	N
Cypripedium arietinum	ram's head lady's slipper	G3, S2, ST	N	N
Diplazium pycnocarpon	glade fern	G5, S2, SC	N	N
Dryopteris expansa	spreading woodfern	G5, S2, SC	C	N
Dryopteris filix-mas	male fern	G5, S1, SC	N	N
Eleocharis olivacea	bright green spikerush	G5, S2, SC	C	N
Eleocharis quinqueflora	fewflower spikerush	G5, S2, SC	N	N
Equisetum palustre	marsh horsetail	G5, S2, SC	N	N
Eriophorum chamissonis	Chamisso's cottongrass	G5, S1, SC	N	N
Huperzia selago	fir clubmoss	G5, S1S2, SC	N	N
Juglans cinerea	butternut	G4, S2S3, SC	P	N
Juncus stygius	moor rush	G5, S1, SE	N	N
Leucophysalis grandiflora	large false goundcherry	G4? S1, SC	N	N
Littorella uniflora	American shoreweed	G5, S2, SC	C	N
Melica smithii	Smith's melicgrass	G4, S1, SE	N	N
Moehringia macrophylla	largeleaf sandwort	G5, S1, SE	N	N
Panax quinquefolius	American ginseng	G3G4	C	Y
Parnassia palustris	marsh grass of Parnassus	G5, S1S2, ST	N	N
Piptatheropsis canadensis	Canada ricegrass	G4G5, S1, SC	M	N
Poa paludigena	bog bluegrass	G3, S3, SC	N	N
Polemonium occidentale ssp lacustre	western polemonium	G5? T2Q, S1, SE	N	N
Polystichum braunii	Braun's hollyfern	G5, S3, ST	N	N
Potamogeton confervoides	Tuckerman's pondweed	G5, S2, ST	C	N
Potamogeton hillii	Hill's pondweed	G3, S1, SC	N	N
Pyrola minor	snowline wintergreen	G5, S1, SE	N	N

Ranunculus gmelinii	Gmelin's buttercup	G5, S2, SE	N	N
Ranunculus lapponicus	Lapland buttercup	G5, S1, SE	N	N
Rhynchospora fusca	brown beaksedge	G4G5, S2, SC	N	N
Sparganium glomerulatum	clustered bur-read	G4? S2, ST	N	N
Streptopus amplexifolius	claspleaf twistedstalk	G5	N	N
Tiarella cordifolia	heartleaf foamflower	G5, S1, SE	N	N
Usnea longissima	beard lichen	G5, S1, SC	N	N
Vaccinium cespitosum	dwarf bilberry	G5, S2, SE	N	N
Valeriana uliginosa	mountain valerian	G4, S2, ST	N	N

State Element Rank: S1 – Critically imperiled S2 – Imperiled S3 – Rare or uncommon S#B – Long-distance migrant, breeding status S#N – Long-distance migrant, non-breeding status	State Status: SE – State endangered ST – State threatened SC – State special concern
Global Element Rank: G3 – Very rare and local throughout range G4 – Apparently globally secure, rare in parts of range G5 – Demonstrably secure globally, rare locally T# - Infraspecific Taxon	Occurrence or Habitat Potential of Occurrence: 1. **C**onfirmed: Species has been observed within or near (within 0.25 miles) the project/proposed project area; a documented occurrence is on file for uncommon or rare species. 2. **P**robable: Habitat is suitable; species has been documented on the Forest but not necessarily within project/proposed project area. Likelihood of occurrence is high. (Consideration is given to transient species such as eastern timber wolf.) 3. **M**inimal: Some habitat exists; species may or may not have been documented on Forest. Likelihood of occurrence within the project area or proposed project area is low. **4. N**one**:** No suitable habitat exists; species has not been documented in project area.

Table 2. Likely-to-occur Regional Forester Sensitive Species

Species	Common Name	Status**	Occurrence or Habitat Potential [2]	Evaluated in Detail
Animals				
Pipistrellus subflavus	Eastern pipistrelle	G5, S3S4, SC	N	N
Plethobasus cyphyus	Bullhead mussel	G3, S1, SE	N	N
Somatochlora forcipata	Forcipate emerald	G5, S2S3, SC	N	N
Plants				
Cardamine maxima	large toothwort	G5, S1, SC	N	N
Carex lenticularis	lakeshore sedge	G5, S2, ST	N	N
Eleocharis engelmannii	Engelmann's spikerush	G4G5, S1, SC	N	N
Listera auriculata	auricled twayblade	G3G4, S1, SE	N	N
Listera convallarioides	broadlipped twayblade	G5, S1, ST	N	N
Petasites sagittatus	arrowleaf sweet coltsfoot	G5, S3, ST	N	N
Platanthera flava var herbiola	palegreen orchid	G4T4Q, S2, ST	N	N
Potamogeton pulcher	spotted pondweed	G5, S1, SE	N	N
Prosartes hookeri	drops-of-gold	G5	N	N
Pterospora andromedea	woodland pinedrops	G5, S1, SE	N	N

These species could potentially occur within or near the CNNF proclamation boundaries. Information about these plant and animals was obtained through the consultation with USDA-FS, U.S. Fish and Wildlife Service (FWS) and Wisconsin Department of Natural Resources (WDNR).

Neotropical migratory birds are considered in the effects analyses of a Biological Evaluation only if they have status as a TES or RFSS. The forest plan was prepared with Neo-tropical Migrant bird species as a focus. The Desired Future Condition within the plan provides for habitat throughout implementation. Therefore, implementation of this project as it pertains to neo-tropical migrants is consistent with the Migratory Bird Treaty Act of 1918, Executive Order of 2001(Responsibilities of Federal Agencies to Protect Migratory Birds) and the 2008 MOU between the USFS-US Fish and Wildlife Service (USFWS) that promotes the conservation and control the take of migratory birds. This MOU has not yet been renewed by the USFWS and as a result the FS will follow the 2001 Executive Order. As it pertains to species analyzed in this document, the Kirtland's warbler is the only federally listed Neotropical bird identified for analysis by the USFWS beyond the anticipated outcomes from implementation of the forest plan.

The BE analysis conducted for this project considered the two alternatives described in the project EA. More than 90 RFSS, including LRFSS, were considered in this BE. Field surveys were conducted 2017 and 2018 within the project area specifically for those species in which that habitat was deemed suitable and had potential effects. Of the species identified in Table 1, 16 have been "confirmed" (6 animals and 10 plants) as occurring in habitat immediately within or adjacent (within 1-mile) to the project site. Those classified as "probable" have not been documented within the project area but could occur where habitat is suitable.

No detailed discussions of effects are provided with regard to species having an occurrence potential of "minimal (M)" or "none (N)" since the likelihood of these species occurring within the project area was determined to be very low. Cumulative effects were considered for the various species listed for which habitat was deemed suitable in or near the project area. Details of this analysis are explained in the "Process Paper: Habitat Models for Effects Analyses; Animal RFSS" (St. Pierre, M., 2010). The possible effects to this habitat include impacts from other projects (recent past, present and future) as identified in

the Forest-wide effects tables contained in the species write ups below. Other district and CNNF projects that were included in the cumulative effects analysis are listed in Table 3.

Table 3. CNNF projects that are past, present and reasonably foreseeable and are considered in the cumulative effects analysis.

Past, Present, Reasonably Foreseeable Projects	
CNNF WEST ZONE PROJECTS (MPF, GD, WB) *	
Black Torch	Medford Aspen II
Chequamegon Salvage Restoration	Twenty Mile
Cayuga	Park Falls Hardwood
ESHI Great Divide	Riley WMA
ESHI Medford	Fishbone
Twin Ghost	Greenwood
Kidrick	NW Sands
CNNF EAST ZONE PROJECTS (ER/FL, LK/LA)	
ESHI – Eagle River / Florence RD	Phelps
ESHI – Eagle River / Florence RD	Boulder
FIshel	Honey Creek Padus
Grubhoe	Lakewood Southeast
Long Rail	McCaslin
Moran Lake	Townsend
NW Howell	

*MPF- Medford Park Falls RD, GD- Great Divide RD, WB- Washburn RD, ER/FL- Eagle River/Florence RD, LKLA- Lakewood/Laona RD

Resource Indicators and Measures

Methodology, Spatial and Temporal Context for Effects Analysis

Forest Service Lands

Each RFSS was reviewed for new information. This review included consultation with local and state experts, new literature, and how the scientific information was used in the development of the 2004 Chequamegon-Nicolet National Forest Land and Resource Management Plan (forest plan). Considering the best available and most recent scientific information, the relevant factors for each species were determined.

Models were developed to apply available data to this best available science so that determination of suitable habitat could be spatially and temporally assessed (St. Pierre, M., 2010). These models include a description of suitable habitat, both in qualitative terms and the Forest Service's Vegetation (FSVeg) database which describes forest cover or vegetation type, size, density, and year of origin. The habitat variables of forest type, age of the stand, and canopy cover were chosen because they represent the larger suite of variables (including tree height, stand basal area, amount of large woody debris and snags) that are related to species' habitat preferences. Different forest types are defined by the tree species diversity within the stand. The age of the stand is correlated with the structural complexity of the stand; older stands have more structure (downed wood, snags, trees of variable height, etc.) It is recognized that the relationships between stand age and these other variables may not be linear but they are positive height (Carmean, W.H., J.T. Hahn, R.D. Jacobs., 1989), large woody debris in 40+ year old stands (Gore, J.A. and W.A. Patterson III, 1986). The outcome of a review of the literature resulted in setting an age cut-off (50 years) by which time it is expected that the tree heights and diameters, and LWD accumulation have exceeded the minimums suggested in the literature for a number of species with an affinity for mature hardwood forest (such as red-shouldered hawk and American marten).

Specifically for American marten, additional variables such as slope, the density of predators, the amount of tip-up mounds in the stand, a fragmentation metric, patch size and proximity to water are not included in a habitat model because no data has been offered by the two Species Viability Evaluation panels (convened during the last Forest Plan revision (2004)) nor any group (USFWS, USFS, GLIFWC) or any researcher focused on marten within Wisconsin since the Forest Plan was revised. Without credible scientific data on the species' minimum requirements or maximum tolerances, any proposed threshold (e.g., minimum patch size) criteria would be poorly linked to the biology of these species on the CNNF, likely leading to erroneous environmental effects determinations. Furthermore, any attempt to address this lack of data with educated guesses by the Forest Service would jeopardize any potential gain in model accuracy. Particularly with the variables of habitat connectivity and patch size, the Forest does not address them in this project because the entire district is considered one patch of marten habitat (see Figure 15). This large extent of available suitable habitat across the district does not lend itself to multiple patches to be managed, but rather one patch (Figure 1). Given this habitat abundance, connectivity is also readily available to allow marten individuals to easily move away from disturbance (i.e., timber and road management activities associated with this project). As such, the marten effects model, particularly when addressing cumulative effects, incorporates areas larger than the project area (and its 1-mile buffer) to determine whether connectivity is affected by the proposed project. For red-shouldered hawks canopy closure was an important variable in determining the suitability of habitat such that greater canopy closure is better for the species. In an analysis of the habitat currently being used by these species on the CNNF, 80% emerged as an appropriate threshold for canopy closure and it is consistent with the habitat use of these species elsewhere in North America.

In order to systematically analyze cumulative effects of this project and many other projects, information about all major current and planned vegetation management projects on the Forest were evaluated. This information was organized by species and by using their habitat models described above, we are able to calculate the current amount of habitat (acres) and annual changes to the availability of this habitat resulting from the short and long-term effects of each management project. For the purposes of wildlife effects analyses, short term effects are 5 years or less and long term effects are greater than that (often up to 50

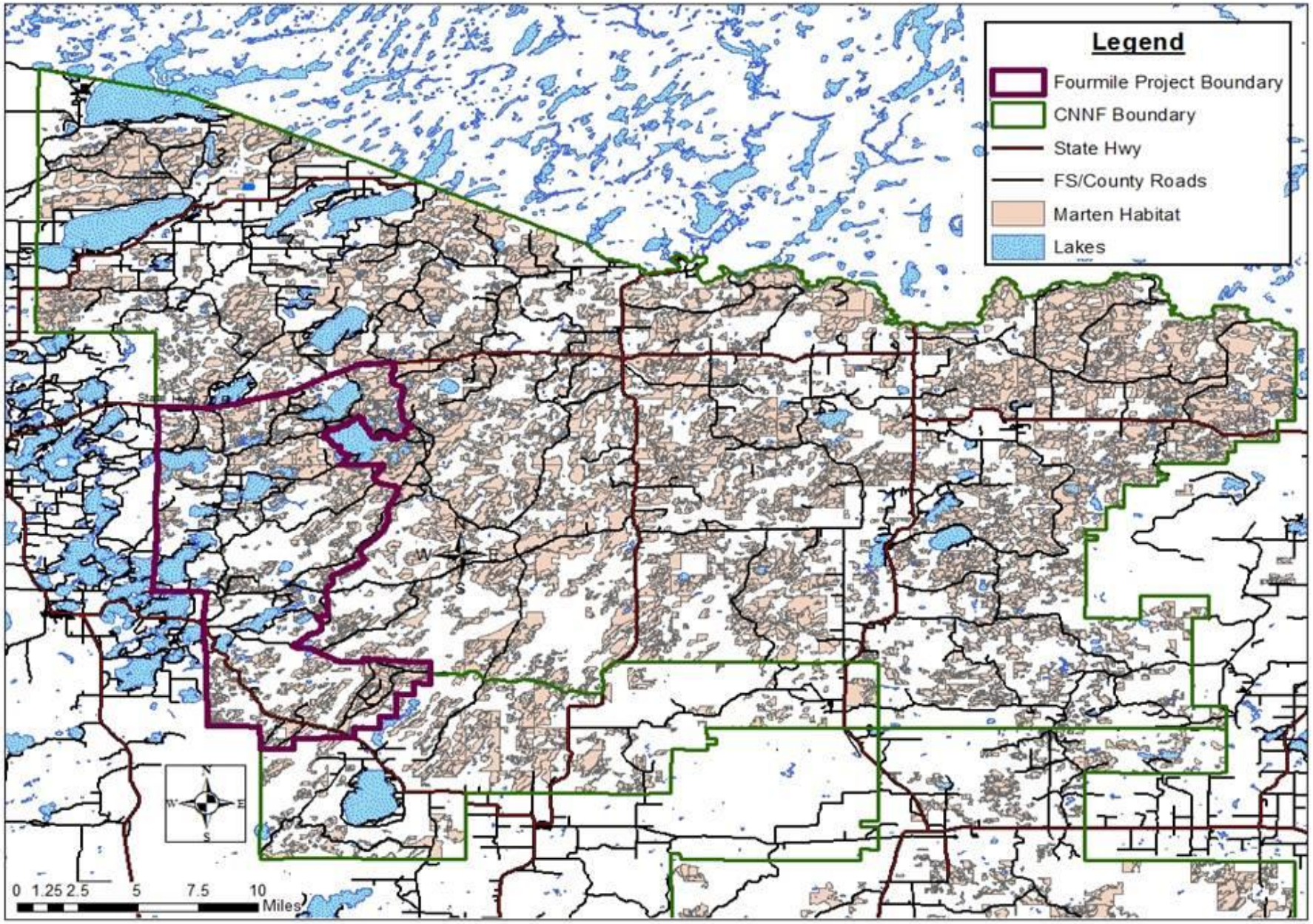

Figure 1. Suitable marten habitat on the Eagle River/Florence Ranger District with Fourmile Project Boundary.

years) (St. Pierre, M., 2010). Where applicable, in growth and outgrowth of habitat (changes resulting from natural aging of stands) was also projected. These projections represent a major component in the cumulative effects analysis for any Forest project and cumulative effects analysis boundary. Data used in the cumulative effects analysis for individual species can be found in the project record.

Non-Forest Service Lands

Non-Forest Service lands were analyzed inside and within a 1-mile buffer outside the project area. The one mile extended analysis of adjacent property is specifically for red-shouldered hawks that required cumulative effects analysis and for goshawk that are a Management Indicator Species. The 1 mile distance far exceeds the distance they are known to relocate following abandonment or disuse of a previously occupied nest site (Ennis, K. R., J. Blum, J. Kelly, C. Schumacher, E. Padley, and T. Schuetz, 1993), (Bosakowski, 1999) (Woodford, 2005). This provides context for the relative availability of habitat on adjacent and non-USFS lands.

There are approximately 11,146 acres (Table 4) and 16,756 acres (Table 5) of non-Federal lands within and outside the project area respectively and these lands are owned by private individuals, industrial groups or the state of Wisconsin.

The suitability of vegetation types for TES and RFSS on these non-FS lands was completed with the use of the “Characterization of Lands of Other Ownership within and adjacent to the Chequamegon-Nicolet National Forest” (Veen, D. and M. S. Pierre, 2009). This land cover data for lands of other ownerships was created using manual delineation and classification based primarily on NAIP imagery. A GIS polygon layer was developed for in-holdings within the CNNF boundary and lands within a 5-mile buffer outside the CNNF boundary. Land cover was classified into 13 categories: Upland Opening, Upland Hardwoods, Aspen, Oak, Pine, Spruce/Fir, Lowland Hardwoods, Lowland Conifers, Lowland Opening, Water, Agriculture, Clear-cut, and Urban. Pine, aspen, and upland hardwoods stands were also described as being young or mixed with other tree species. Some of these non-FS lands were WDNR managed lands in Oconto and Marinette counties and as a result had field generated data related to current forest types. This situation was unique to this project and it allowed us to update and improve the vegetation type coding of adjacent similar habitats that were previously only identified by NAIP imagery.

Habitat types of non FS lands within the project area are mostly water (33%), upland hardwoods (19%), lowland habitat 20% (conifer 12.2%, opening 6.5% and hardwoods 1.0%) and aspen 8% (Table 4). Most of the larger upland hardwood are located adjacent to or near several large lakes scattered throughout the project area; Butternut, Franklin, Sevenmile, Lower Stone, Fourmile and Big Fork Lake. These lakes along with others in the area also have a majority of the urban development adjacent to their shoreline (9.8%). The lowland areas are mostly associated with rivers and lakes and are also scattered throughout the project area. Much of the upland hardwood habitat would be considered unsuitable for many TES and RFSS specie due to their proximity to this lake development. This would include red-shouldered hawks and American marten that tend to use continuous blocks of undisturbed habitat. WVW and bats would have a higher chance of occupying these stands due to having a higher tolerance to disturbance. The lowland hardwood component for red-shouldered habitat is located mostly in the southern third of the project area. This lowland habitat could also possibly provide habitat for spruce grouse, Connecticut warbler, black-backed woodpeckers and bats.

Table 4. Habitat type composition of the non-federal lands within the project area and the species which may find suitable habitat within these cover type categories**.**

Cover Type	Acres	%	RDSH	SPGR	AMMA	COWA	BBWP	WVW	BATS
Agriculture	24	0.2	0	0	0	0	0	0	24
Aspen	**873**	**7.8**	0	0	873	0	0	873	873
Clear-cut	16	0.1	0	0	0	0	0	0	16
Lowland Conifers	**1,362**	**12.2**	0	1,362	0	1,362	1,362	0	1,362
Lowland Hardwoods	**113**	**1.0**	113	0	0	0	0	0	113
Lowland Opening	729	**6.5**	0	0	0	0	0	0	729
Oak	261	2.3	261	0	0	0	0	0	261
Pine	468	4.2	0	0	0	468	468	0	468
Spruce/Fir	253	2.3	0	253	0	253	253	0	253
Upland Hardwoods	**2,155**	**19.3**	2,155	0	2,155	0	0	2,155	2,155
Upland Opening	106	0.9	0	0	0	0	0	0	106
Urban	**1,095**	**9.8**	0	0	0	0	0	0	0
Water	**3,691**	**33.1**	0	0	0	0	0	0	0
Total	11,146	100	2,529	1,615	3,028	2,084	2,084	3,028	6,360

Non Forest Service property within the 1 mile buffer is similar to within the project area with mostly water (24%), aspen (19%), upland hardwoods (14%) followed by lowland habitat 28%, (conifer 9%, opening 8% and hardwoods 1%) and then urban development at 9% (Table 5).

Most of this habitat is located to the east of the project area outside of the Forest boundary with smaller areas on the south end near the town of Hiles and to the north around Anvil Lake. Largest blocks of upland habitat are the aspen stands north of Little Fork and Island Lakes. Majority of the lowland habitat is also on the south end east of Margaret Lake and near Eagle River. This lowland habitat could be suitable for bats, spruce grouse, Connecticut warbler and blacked backed woodpeckers.

Table 5. Habitat type composition of the non-federal lands within a one-mile buffer outside the project area and the species which may find suitable habitat within these cover type categories.

Cover Type	Acres	%	RDSH	SPGR	AMMA	COWA	BBWP	WVW	BATS
Agriculture	355	2.1	0	0	0	0	0	0	355
Aspen	**3,122**	**18.6**	0	0	3,122	0	0	3,122	3,122
Clear-cut	225	1.3	0	0	0	0	0	0	225
Lowland Conifers	**1,506**	**9.0**	0	1,506	0	1,506	1,506	0	1,506
Lowland Hardwoods	**147**	**0.9**	147	0	0	0	0	0	147
Lowland Opening	**1,339**	**8.0**	0	0	0	0	0	0	1,339
Oak	309	1.8	309	0	0	0	0	0	309
Pine	1,118	6.7	0	0	0	1,118	1,118	0	1,118
Spruce/Fir	588	3.5	0	588	0	588	588	0	588
Upland Hardwoods	**2,350**	**14.0**	2,350	0	2,350	0	0	2,350	2,350
Upland Opening	196	1.2	0	0	0	0	0	0	196
Urban	**1,492**	**8.9**	0	0	0	0	0	0	0
Water	**4,010**	**23.9**	0	0	0	0	0	0	0
Total	16,756	100	2,806	2,094	5,472	3,212	3,212	5,472	11,254

Cover type acres identified as being suitable for TES and RFSS on non-FS lands within the project area and the one mile buffer, were totaled for cumulative effects analysis (Table 4 and Table 5). Upland hardwood and lowland conifer habitat was the most common habitat and had the most species associated with it for cumulative effects analysis.

The WDNR provided timber management history on those private lands that were enrolled in the Managed Forest Law (MFL) program. This included forest stand type, harvest treatment, year of harvest and future management plans. For those privately owned forest lands that were not enrolled in MLF, the following assumptions for the analysis were made:

- The age structure of the forested lands is similar to the age structure of the same forest types on the CNNF.
- All forested lands not registered within the MFL program are treated as they were enrolled. For any adjacent and other ownership lands that are managed for timber production, there are tax incentives to enroll in this program therefore, it is logical that such an assumption is reasonable. While there are probably adjacent and other ownership lands that are not managed for timber. For the purposes of this analysis of cumulative effects of timber harvesting, we assume that all lands are managed for timber production, which uses a “maximum effect” scenario.
- Non-USFS lands that are classified as northern hardwoods are treated on a 15-year re-entry interval and are harvested when they reach approximately 120 ft^2/ac and are reduced to 80-90 ft^2/ac basal area. This generally corresponds with a selection harvest with canopy gaps.
- Aspen stands are clear-cut when they are approximately 45 years of age.
- Lands that are currently aspen cover type would be maintained as aspen and lands that are currently hardwoods would be maintained as hardwoods. No adjacent and other ownership lands are assumed to be converted to other forest types. The assumption is more likely to be broken by conversion of aspen to hardwoods than hardwoods to aspen.

Affected Environment

Existing Condition

The Fourmile Vegetation Management project area (hereafter referred to as the Fourmile project area or project area) lies within the southwest portion of the Eagle River-Florence District (portions of Oneida, Vilas, and Forest Counties). The activities are within legal description: T40N, R11E and R12E; T39N, R11E and R12E; and T38N, R11E and R12E. The project area encompasses more than 55,000 acres and roughly 44,000 acres are a part of the Chequamegon-Nicolet National Forest where the activities would occur on.

The project focuses on Management Area 2A, 2B, 4B, and 8A (Argonne Experimental Forest) as identified in the 2004 Chequamegon-Nicolet National Forest Land and Resource Management Plan. In general, the propose and need of the Fourmile Vegetation Management Project is to maintain or restore vegetation communities to their desired conditions in the Chequamegon-Nicolet National Forest Land and Resources Management Plan (going forward in this analysis, this document is known as the Forest Plan), maintain or enhance existing forest research studies, contribute toward satisfying demand for wood products, provide a safe and effectives road system, increase public safety related to wildfire potential, and maintain or enhance quality of recreation experiences within acceptable limits of change to ecosystem stability and condition.

Table 6. Summary of project's forest types

FOREST TYPE	ACRES	%
Upland Types		
Jack Pine (1,30)	662	2.2
Red Pine (2,49)	**4,345**	**14.1**
White Pine (3,4,41)	1,657	5.4
Hemlock (5)	1,537	5.0
Balsam Fir/Aspen (11)	1,019	3.3
Upland Spruce (8,13,16,17)	478	1.6
Oak (43,55,60)	469	1.5
Northern Hardwood (80-89)	**13,439**	**43.7**
Aspen (91,93,94,95)	**4,111**	**13.4**
Birch (92)	924	3.0
Upland Openings (99)	2,121	6.9
Summary Uplands	30,766	100
Lowland Types		
Lowland Conifer (12,14,15,18,19)	**9,313**	**70.1**
Lowland Hardwood (71,76,79)	757	5.7
Lowland Openings (97,98)	**3,225**	**24.3**
Summary Lowlands	13,295	100
Total All FS Acres	44,061.1	

There are many water features in the project area, including Franklin, Lower Ninemile, Sevenmile, Big Fork, Julia, Whitefish lakes, and many smaller lakes. Forest Road 2178 (Military Road), Forest Road 2183 (Scott Lake Road), and Highway 32 run through the project area. There are many other roads that wind through the project area, as well, providing scenic drives and recreation opportunities. The forest composition on National Forest System lands in the project area is dominated by mixed northern hardwoods, aspen, and red pine along with lowland conifer.

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Aspen (*Populus tremuloides)*. Within the project area, there are about 4,111 acres of aspen forest types. Aspen is a shade intolerant species and is considered a "pioneer" tree species on sites that are recovering from intense disturbance. Under natural conditions, aspen is regenerated by disturbances such as wildfires, windstorms followed by high intensity fires or other events.

Aspen management is a key area of interest within the forest plan and by a number of interest groups. Young aspen is highly valuable as habitat for a number of game and non-game species. At the same time, it is highly sought after as a source of pulpwood for high quality paper and saw timber for a variety of other products. It is a shade intolerant tree species and is considered a "pioneer" tree species on sites that are recovering from intense disturbance.

Table 7. Fourmile project's existing and desired aspen age class distribution.

Aspen Age Class	Desired Condition	Existing Condition	After Treatment
0-10	15-25%	4%	39%
11-30	15-25%	2%	2%
31-45	45-55%	63%	46%
46+	5-15%	32%	13%

Under natural conditions, aspen is regenerated by disturbances such as wildfires, windstorms followed by high intensity fires or other events that leave a site devoid of vegetation. These conditions are favorable for aspen root suckering and seeding (Forest Plan FEIS Appendix F, pp. F-4 and F-5). There is an overabundance of aspen in the oldest age class and there is a lack of representation in the youngest age class (Table 7). This is the case both within the Fourmile Project area and at the forest level. It is for this reason that even-aged aspen regeneration is being proposed in accordance with forest plan direction (p. 2-5).

There needs to be about 711 acres of aspen regenerated to meet the DFC of 15%-25% of aspen in the 0-10 age class. This acreage should be taken from the 21-45 and 46+ age classes. In the proposed action however we plan to regenerate more than those acres because of the overabundance of older aspen age classes. If left these stands will deteriorate and most likely convert to another species since it will be probably 8-10 years before we can come back to the Fourmile project area. That timeline would not meet forest plan guidelines for diversity.

Red Pine (*Pinus resinosa*). Red pine is fairly intolerant of shade, but more tolerant than species such as aspen, paper birch, and jack pine. It is best managed under even-aged conditions ((USDA Forest Service, 2004a), Appendix F, page F-6). Desired age classes for red pine are given in the Forest Plan (p. 2-10).

Table 8. Fourmile project's existing and desired red pine age class distribution.

Red Pine	Desired Condition	Existing Condition	After Treatment
0-20	10-20%	1%	6%
21-60	25-35%	32%	31%
61-100	25-35%	52%	50%
100+	10-20%	14%	13%

There is 3,834 acres of red pine in the project area and most that was planted in the era of the Civilian Conservation Corps. Planting records from the 1930's and early 1940's describes the planting of vast areas of cutover lands. These 60-70 year-old stands comprise a "spike" in the amount of 61-100 year old stands. On the other hand, there are no red pine stands 0-20 years of age.

This project area leads to a great opportunity to maintain these historical stands, and to sustain the investment that was original put into these areas. In the proposed action, 2,549 acres would be managed either by a thinning to reduce stocking and to increase growth and vigor or complete the transition of the stand to another species by means of shelterwoods and clearcuts (both of these treatments together only equal about 88 acres).

Northern hardwoods. In the upper Midwest, northern hardwood stands are typically dominated by sugar maple (*Acer sacharum)*. They are also highly variable containing a wide variety of species that include white ash, red maple, basswood, yellow birch, black cherry, and hemlock. Because many of the essential northern hardwood species are more shade tolerant, northern hardwood stands can be managed under a wide variety of silvicultural systems. Most commonly, they are managed under the uneven-aged single tree selection method or the even-aged shelterwood method.

Table 9. Fourmile project's existing and desired hardwood age class distribution.

Hardwood	Desired Condition	Existing Condition	After Treatment
0-20	10-20%	0%	<1%
21-60	30-40%	4%	3%
61-100	30-40%	49%	40%
101+	10-30%	14%	3.0%
UEA		33%	44%

Management Areas 2A and 2C does not emphasize even-aged management, but, rather, uneven-aged management (USDA Forest Service, 2004a), p. 3-8 thru p. 3-9 and p. 3-44 thru p. 3-46). One of the goals of this project is to maintain and enhance the within-stand diversity of the northern hardwood stands. Certain design features would be used in the selectively harvested areas to foster species diversity. To name a few, these would include the use of large canopy gaps, and whole tree logging. The hardwood stands in the Fourmile Project Area are, overwhelmingly, in the 61-100 year age class. In fact, 49% of the hardwood falls within this 40-year range. For the majority of the project area, the forest plan emphasis is on uneven-aged management. Only 33% of the hardwood stands in the project area are currently *uneven*-aged- that is, containing three or more distinct age classes. Thus, one of the needs identified for this project is to move more of the hardwood stands toward uneven-aged conditions

Description of Alternatives

See chapter 2 of the Fourmile EA for a detailed description of the alternatives, maps of the project area, and summary of other proposed management activities.

Table 10. Relevant management activities, by alternative, for the Fourmile project.

	Alt. 1	Alt. 2
Total Acres Harvested	**0**	**11,694**
Acres selection harvest (4151, non-Argonne)	0	5,249
Acres thinning (4220, 4521)	0	3,423
Acres clearcut (4117)	0	1,190
Acres shelterwood (4131)	0	403
Acres Improvement cut (4210)	0	263
Acres Spruce Salvage (4231, 4232)	0	227
Acres “Experiments” (4151-Argonne)	0	526
Acres Restoration /Thin (4220,4113)	0	181
Acres Overstory Removal (4141)	0	232
Estimated volume (MBF)	0	45.42
Acres of Ladder Fuel Reduction	0	229
Acres of Prescribed Burning (Regen or Restoration Purposes)	0	334
Acres of Canopy Gap Created	0	5,169
Miles Trails Maintained	0	36.1
Acres of Existing Openings Maintained	0	134
Miles of road construction (permanent)	0	+1.2
Miles of road construction (temporary)	0	+0.2
Road reconstruction	0	+46.4
Road Decommission	0	-147.2
Road totals	0	-100.4

Environmental Consequences

Federally Threatened and Endangered Species

Rusty Patched Bumble Bee (*Bombus affinis*)

Historically, rusty patched bumble bees occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, many of which have been lost, degraded, or fragmented by conversion to other uses. This bumble bee needs areas that provide food (nectar and pollen from flowers), nesting sites (underground and abandoned rodent cavities or clumps of grasses above ground), and overwintering sites for hibernating queens (undisturbed soil)

Rusty patched bumble bee colonies experience an annual cycle. In spring, a solitary queen finds a suitable nest site, collects nectar, and pollen from flowers and begins laying eggs, which are fertilized by sperm she has stored since mating the previous fall. Workers hatch from these first eggs and the colony grows as workers collect food, defend the colony, and care for young. The queen remains within the nest and continues laying eggs. In late summer, new queens and males also hatch from eggs. Males disperse to mate with new queens from other colonies. At the end of the season the queen dies and only new queens go into diapause (a form of hibernation) over winter. The cycle begins again in spring.

Historically, the rusty patched bumble bee was broadly distributed across the eastern United States and Upper Midwest, from Maine in the U.S. and southern Quebec and Ontario in Canada, south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Its range included 28 states, the District of Columbia and two provinces in Canada. Since 2000, this bumble bee has been reported from only 12 states and one province: Illinois, Indiana, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin and Ontario, Canada.

Threats and Limiting Factors

Since the late 1990s, rusty patched bumble bee abundance and distribution has declined significantly. Historically, the rusty patched bumble bee has been documented from 926 populations; since 1999, the species has been observed at 103 populations, which represents an 88 percent decline from the number of populations documented prior to 2000. Furthermore, many of the current populations are documented by only a few individuals; 95 percent of the populations are documented by five or fewer individuals; the maximum number found at any site was 30. The number of individuals constituting a healthy colony is typically several hundred, and a healthy population typically contains tens to hundreds of colonies (USDI Fish and Wildlife Service, 2017a).

Along with the loss of populations, a marked decrease in the range and distribution has occurred in recent times. Since 2000, the species' distribution has declined across its range, with current records from six ecoregions, 14 States or Provinces, and 55 counties; this represents an 87-percent loss of spatial extent (expressed as a loss of counties with the species) within the historical range.

Many of the existing populations, however, face the effects of past and ongoing stressors, including pathogens, pesticides, habitat loss and degradation, small population dynamics, and effects of climate change.

For a detail description of all the threats to the Rusty patched bumble bee refer to the FWS "Rusty Patched Bumble Bee (*Bombus affinis*) Species Status Assessment" (Szymanski et. at. (2016).

Direct, Indirect and Cumulative Effects

The US Fish and Wildlife Service has adapted a habitat connectivity model to identify the zones around current (2007-2016) records where there is a high potential for the species to be present. This model considers both foraging and dispersal distance from current records to determine those areas of "high potential".

It was determined by using the FWS Information for Planning and Conservation website (IPaC, https://ecos.fws.gov/ipac/), that there are no areas within or adjacent to the Fourmile project area that would have a high potential for the rusty patch bumblebee to be present. The nearest known record to the project area is approximately 175 miles to the southwest.

Determination: (All Alternatives):

No effect. Since there is no overlap of the project area with locations where the rusty patched bumble bee is likely to be present, there will be no direct or indirect effects and therefore no cumulative effects to the species by actions proposed by the Fourmile Project.

Eastern Timber Wolf (*Canis lupis*)

The Eastern Timber Wolf occurred throughout Wisconsin prior to settlement about 1832 (Nowak, 1995). Estimates of presettlement numbers vary, with the most credible being 3,000-5,000 (Wydeven, 1993). Prior to settlement, five species of ungulate were found in Wisconsin: bison, elk, moose, caribou, and white-tailed deer (Schorger, 1942) (Scott, 1939). All five species were potential prey for wolves (Mech, 1970). By 1880, deer were the only wild ungulate species remaining in viable numbers within the state (Scott, 1939). Negative attitudes towards wolves prevailed among Europeans who settled in the Territory in the late 1830s and in 1865 the State legislature instituted a bounty (Thiel, 1993). By 1930, wolves were restricted to less than a dozen counties in northern Wisconsin and by this time, sport hunters were killing wolves because they were considered unwanted competitors for deer (Flader, 1974) (Thiel, 1993). The wolf population declined from an estimated 150 in 1930 to less than 50 by 1950 (Thiel, 1993). The last wolf packs in Wisconsin disappeared by 1956-57, just when the State legislature removed the timber wolf from the bounty. The last Wisconsin wolves were killed in 1958 and 1959 (Thiel, 1993).

Wolves expanded back into Wisconsin in winter 1974-75 when a wolf pack was discovered in the border area between Wisconsin and Minnesota south of Duluth-Superior (Thiel, 1993) and by 1980, five wolf packs were known to occur in northern Wisconsin (Thiel, 1993) (Wydeven, A. P., R.N. Schultz, and R.P. Thiel., 1995).

An intensive wolf-monitoring program was instituted by the WDNR and the USFWS in 1979. During the 1980s, wolf numbers fluctuated between a low of 15 animals in 1985 to a high of 31 in 1989 (Wydeven, A. P., R.N. Schultz, and R.P. Thiel., 1995). High mortality rates (greater than 35% annually) were caused primarily by humans, with gunshot the leading cause of death (Wydeven, A. P., R.N. Schultz, and R.P. Thiel., 1995).

Since the early 1980s, the CNNF has participated annually in wolf survey and monitoring activities. These activities are done cooperatively with the WDNR and the USFWS. Survey and monitoring activities consist of winter carnivore tracking surveys, summer howling surveys, radio tagging of new wolf packs and weekly aerial telemetry tracking of radio marked packs. These survey and monitoring activities provide the CNNF with critical information on; pack establishment or losses, animal and pack movements, territory locations, shifts and sizes, breeding activities, productivity and causes of mortalities.

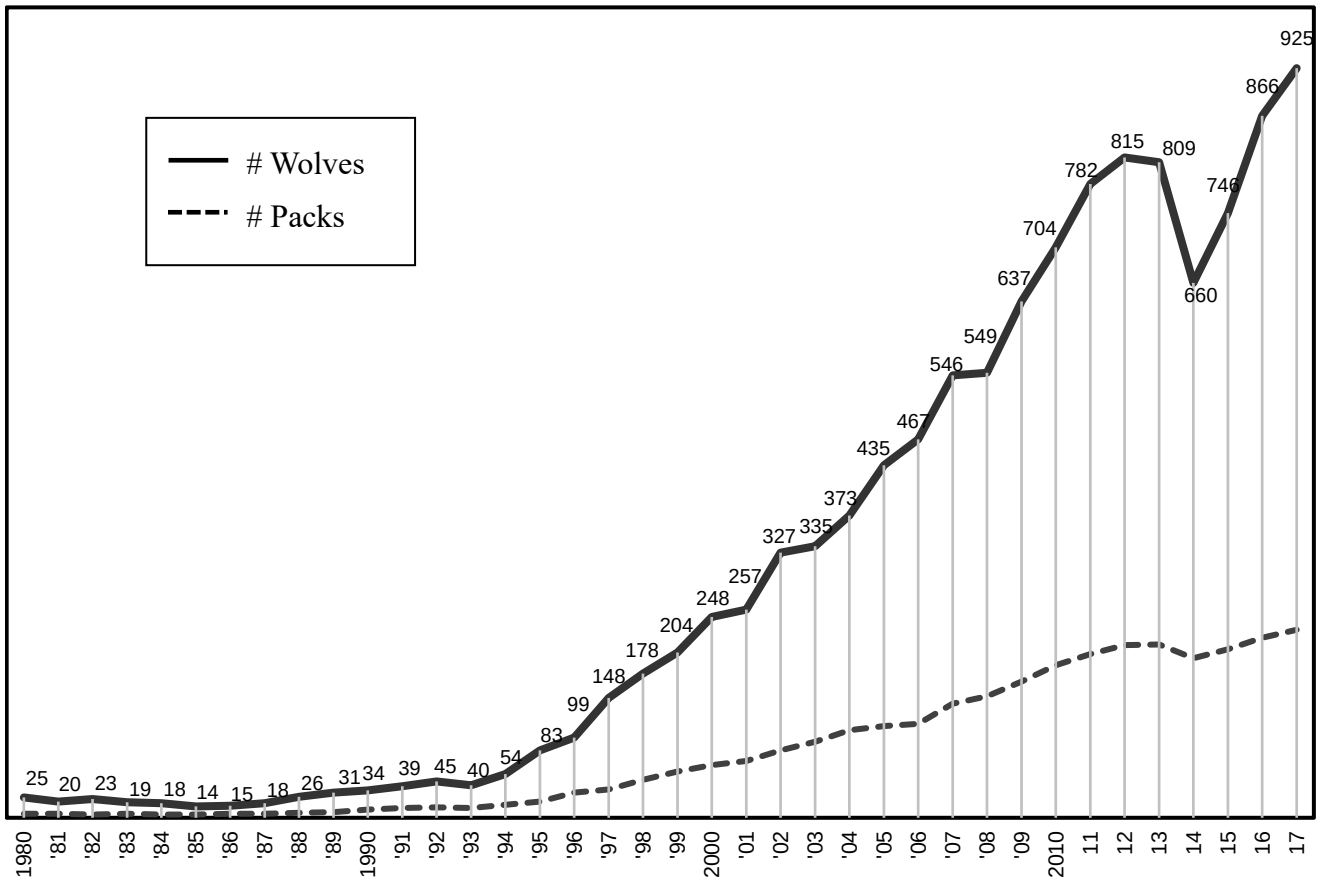


Figure 2. Wolf population trends in Wisconsin 1980 - 2017 (packs and individuals).

Wolf numbers have steadily increased since 1993 population of 40 animals in the state to the winter of 2011-2012 with an estimated population of 815 animals (Table 1). This represents the 12th year in a row that the Wisconsin wolf population had exceeded the state management goal of 350 wolves outside of Indian reservations in the state (Wiedenhoeft et. al. (2015).

In January 2012 the federal government removed the wolf from protections of the Endangered Species Act and states in the Great Lakes region resumed management of the species. The Wisconsin Legislature passed Act 169 in April 2012, authorizing the first regulated wolf hunting and trapping season in state history. In 2012, 2013 and 2014 there were 117, 257 and 154 wolves harvested respectively by hunters and trappers. However, in December 2014, a federal judge ruling once again placed the wolf back on the federal endangered species list which bans hunting and trapping of wolves in the state.

Wolves live in family groups referred to as “packs” that consist of a dominant breeding pair, surviving offspring from the previous year and current year pups. Pack sizes vary from two to ten animals with the average pack size of 4.3 animals. Each family occupies an exclusive territory ranging from 19-159.8 square miles with an average 69.9 square miles in Wisconsin (WDNR, 1999). Wolves are susceptible to disease, predation, human persecution, starvation, and vehicle collisions. Human-caused deaths in Wisconsin declined from 72 % of mortality during a period of 1972-85 to 22 % from 1986-1992 (WDNR, 1999). During the period 1993-96, 50 % of wolf mortality in the State of Wisconsin was caused by humans and over 25 % of that resulted from vehicle collisions (WDNR, 1999). In April 2012, the Wisconsin Legislature passed a bill allowing a wolf hunting/trapping season to occur later that fall season. This reduced the number of wolves in the state but the WDNR monitored the population numbers and would close the season early if it feels that is necessary for wolf management. Disease also plays a role in wolf mortality across its range and in

Wisconsin, with wolves being susceptible to canine distemper, canine parvovirus, Lyme disease, mange, and blastomycosis.

Wolf habitat has been defined as areas having the following characteristics (Mladenoff D. T., 1995) (Mladenoff D. T., 1997) (WDNR, 1999):

- Low human population densities
- Sufficient prey (deer, beaver, etc.)
- Low road densities (4.8 km/km^2 or 2.9 mi/mi^2)
- Appropriate vegetation cover and landscape patterns

Of these elements, road density and complexity of the spatial landscape pattern (low fragmentation from agricultural or urbanizing landscape) appear to be the most important. Based on these criteria, the WDNR (1999) estimates that there are currently 15,052 km^2 (5811 mi^2) of favorable habitat in the state. This includes an estimated 75 % of the CNNF landbase, because it is relatively undeveloped and generally falls in the road density range suitable for wolves as described in the Eastern Timber Wolf Recovery Plan (USDI Fish and Wildlife Service, 1978 & 1992) (WDNR, 1999).

Additionally, prey availability also plays a key role in defining wolf habitat. Wolves are large carnivores that require an abundance of prey such as white-tailed deer and beaver to survive. Historically the WDNR had 12 deer management units (units 3, 6, 13, 29A, 30, 39, 40, 44, 45, 49A, and 50) in the Northern Forest Management Region that were either solely or partially within the CNNF. These deer management units' (DMUs) over-winter goals averaged approximately 16 deer / sq. mile of deer range when implementation of the forest plan began (USDA Forest Service, 2004a). Although increases and decreases in deer populations vary in the DMU's across the Forest, these CNNF units were below post-hunt population goals in 2004. Since that time, deer population levels within these units have fluctuated (from more than 20 % above post-hunt goals to a range of 5 to 57 % below post-hunt goal) due to a host of factors. These factors include but are not limited to: special hunts (T-Zones, Earn-A-Buck), archery and firearm seasons frameworks and success rates, winter weather conditions, and predation (USDA Forest Service, 2012). In 2014 the WDNR replaced this system with county based DMUs to enable greater public input on the herd management process at a more localized level. Forest and Farmland Management Zones were also created that included selected DMUs that were based on basic deer habitat types and herd productivity. The predominant habitat type (forest or farmland) within a county determined which zone and season structure it would follow. A County Deer Advisory Councils (CDAC) was then created for each DMU that recommend deer harvest quotas and permit levels to the Natural Resources Board (NRB) for approval. The NRB would then approve each council's recommendations for three-year deer population objectives.

The eastern half of the project area resides in Forest County DMU and the western side is mostly in Oneida and the northwestern section is in Vials County DMU. The WDNR has estimated that the 2018 over winter population density for Forest is 17 deer/sq. mi., Oneida is 21 deer /sq. mi. and Vilas county is at 19 deer/sq. mile (WDNR, 2018)**.** The Natural Resource Board approved objectives for 2018-19 in these counties to increase the deer herd populations in Forest and to maintain it in Vilas and Oneida counties. With these recommendations of increasing and maintaining the deer herd in the project area DMUs, wolves are unlikely to be limited by the availability of prey.

According to the criteria listed above, the majority of the CNNF can be considered suitable wolf habitat. Mladenoff et. al. (1995) determined that approximately 45 % of National Forest lands in northern Wisconsin could be classified as "primary wolf habitat" and 36 % could be classified as "secondary habitat"; which leaves 19 % classified as unsuitable (WDNR, 1999). Essentially all of the project area can be considered suitable habitat due to human population densities, prey availability, current road densities, and landscape pattern.

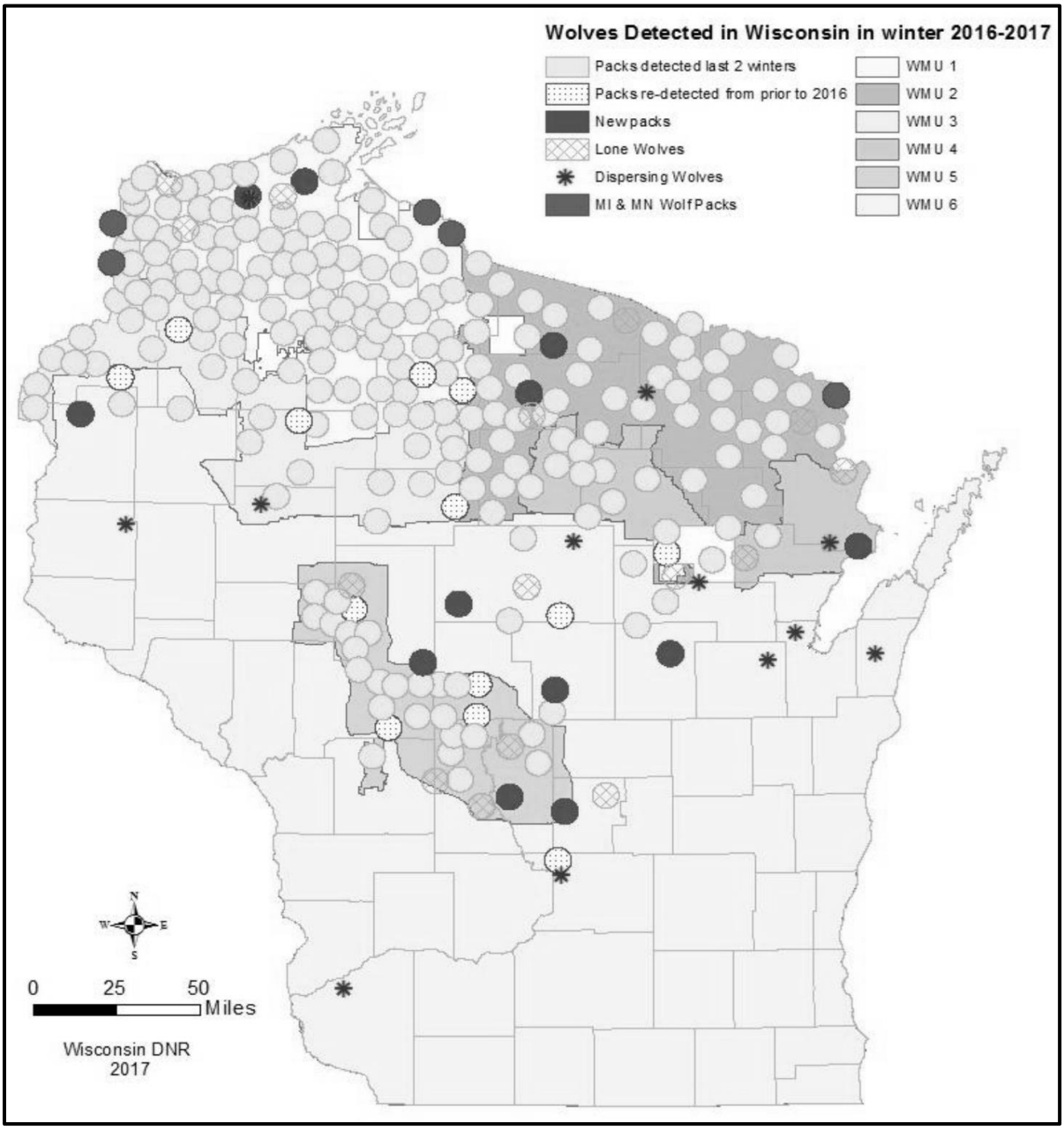


Figure 3. Distribution of wolf territories in Wisconsin in 2017 (WDNR, 2016b).

Diseases in wildlife are difficult to manage. The CNNF coordinates with and relies upon State and local efforts to control animal disease transmissions from pets and livestock (i.e. rabies, distemper, parvovirus, etc.) to wildlife species through administration of and enforcement of vaccination requirements. Natural disease phenomenon (i.e. blastomycosis, mange, etc.), while not routine, are managed by the State with Forest cooperation when human health and safety risks are present.

Effects to wolves from management activities can be measured in three ways:

1. Amount of direct disturbance to denning or rendezvous sites
2. Changes in road densities within suitable and/or occupied habitat
3. Changes in present prey availability - distribution and density

Because no wolf denning or rendezvous sites are known to occur in the project area, measure one does not apply. Measure three is not likely to be informative because prey is abundant and is unlikely to be limiting the wolf distribution. Consequently, only changes in road density (measure two) are likely to provide a useful measure to compare effects of the management alternatives on wolves.

Boundary and Scale of Effects Analyses

Direct and indirect effects to wolves are analyzed at the scale of the project area. If there are direct and/or indirect effects, cumulative effects would be analyzed at the scale of the project as well as at the scale of the entire CNNF. Such a cumulative effects analysis area is appropriate because the species is highly mobile and may move between the Chequamegon (CNF) and Nicolet landbases of the CNNF.

Threshold of Effects

The CNNF wolf population has exceeded the four pack/40 animal goal set in the federal recovery plan (USDI Fish and Wildlife Service, 1978 & 1992) for at least five years. It has exceeded the 80 animals/three consecutive year goal of the Wisconsin state recovery plan for a similar period of time (WDNR, 1999). Across Wisconsin, the gray wolf population had a 2014-2015 winter estimate of 782-824 animals (Wiedenhoeft, J.E., D.M. MacFarland, N.S. Libal, and J. Bruner, 2015). A threshold of effects would have been crossed when management activities on the Forest cause the CNNF to fail to meet population goals set forth by the USDI FWS and the WDNR.

There are three wolf pack territories confirmed in the project area. The Giant Pine pack territory is primarily within the eastern half of project area, Atkins Lake pack at the southern tip and the Ninemile Lake pack is in the northeast corner of the project area. There are no confirmed locations of any wolf dens or rendezvous sites within the project area (Wiedenhoeft, 2017). If a den or rendezvous site is located prior to or during project implementation, Forest standard and guidelines would immediately be implemented to avoid any direct effect to wolves (forest plan p. 2-19).

The WDNR established the first seasonal wolf-hunt in 2012 that was also conducted in 2013 and 2014. Management of wolf populations and harvest quotas are controlled and determined by the WDNR and as a result is beyond the scope of this project and control of the FS. However, some general analysis on wolf management is provided. There are six wolf management zones in the state with each having a harvest quota; Fourmile project area is part of Zone 2. This zone covers the northeastern section of the state and included portions of 11 counties (WDNR, 2016c).

Table 11. Wisconsin wolf hunting quota and harvest results, 2013-2015**.**

Year	Off reservation winter count mid-point	Total quota	State-licensed quota	# Harvest	Harvest Rate as % of winter count
2013-14	154	31	28	29	18.8
2014-15	139	16	15	29	20.9

Wolf harvest locations over the three seasons resulted in only 2 wolves harvested from packs located in the project area. Harvesting wolves from packs within the project area occur at a low rate and if a hunting season continued in the future would likely not result in eradication of that population. This is due in part to several packs that reside in the project area.

Determination of Effects to Eastern Timber Wolf

Alternative 1 - No Action

Direct and Indirect Effects:

Under this alternative, no vegetation management or road construction would occur and there would be no impact on wolves.

Cumulative Effects:

Without any direct or indirect effects on wolves, there can be no cumulative effects.

Determination:

No Effect.

Alternative 2 - Action Alternative

Direct and Indirect Effects:

Disturbance to wolves are not anticipated from the proposed action alternatives that would include such activities as increased human presence during the logging operations, increased truck traffic, and noise generated from the trucks, saws, and logging equipment. This is because the wolf packs have large portions of their territories out of the project area and/or on non-FS lands that they may not be near the activities when they occur. If wolves are close to these activities, they would be able to move easily and freely around the rest of their territory to undisturbed areas that could occur inside or outside the project area. Also, since parts of the pack territories do reside on the CNNF and have for many years, these types of activities would not be new occurrences in their environment and the animals may have already have a certain tolerance for them. There could be direct effects on wolves if treatments were to occur at a den or rendezvous site. However, no den or rendezvous sites have been identified in or near the project area as mentioned (Wiedenhoeft, 2017). If a den or rendezvous site is located prior to or during project implementation, design features would immediately be implemented to remove any direct effect to wolves. Indirectly, prey density, especially white-tailed deer would be expected to fluctuate with new management approach by the state, but generally stay near goal and therefore provide a consistently available prey species.

Implementation of the action alternatives would decommission 147 miles of open road from the existing condition and zero from the No Action Alternative (Table 12). Overall, open road density under all action alternatives would be reduced when compared to the existing condition and Alternative 1. Decommissioning removes a road from the landscape, by activities such as removal of surfacing, restoration of the natural topography, scarifying, and revegetation of the roadbed, removal of culverts, planting trees, and placement of natural obstructions in the roadbed. Decommissioning has a direct effect of putting more land back into a productive state, which can eventually lead to increased forest cover and wildlife habitat. Decommissioning can change both the total and open road density figures for an area and addresses the human access concern. Due to declassification and trail conversion, there would be less public motorized access within the project area. This could result in fewer impacts to wolves from accidental/illegal shootings or trapping.

Road closures are used where a road is still desired for future management needs but have other resource impact concerns. A gate or other barrier is used to prevent public motor vehicle use, while leaving the area behind the closure open to foot travel or administrative use. Road closures affect only the open road density, but still address the human access concern.

Table 12. Proposed actions in the project affecting road density (miles).

	Alt 1	**Alt 2**
Transportation Proposed Action	**Miles**	**Miles**
Road Construction (Permanent)	0	+1.2
Road Construction (Temporary)	0	+0.2
Road Reconstruction	0	+46.4
Road Decommission	0	-147.2
Total	0	-99.4

Cumulative Effects:

There will be minimal impacts to wolf habitat and prey. Lowering open road densities could have a positive impact to wolves. Adding these direct and indirect impact to surrounding past, present, and reasonably foreseeable actions is expected to have minimal cumulative impacts to known wolf numbers in the project area.

Determination:

No Effect. Wolves do not require any particular forest type, thus the timber management under the action alternatives would not have an effect on wolves except for the possibility that wolves would temporarily avoid treatment areas while the logging operations are occurring. This temporary avoidance of the area is not a meaningful effect on wolves.

While there would be an increase in disturbance from habitat manipulation treatments in the project area, this disturbance is anticipated to be temporary in nature and not anticipated to have any long-term negative direct effects to wolves in or near the project area. The action alternatives would not increase open road density when compared to the existing condition and Alternative 1. As a result, at this road density levels there be no detrimental effects to wolves and would encourage habitat for prey species desirable to wolves.

Design features for the Eastern Timber Wolf

There are no known wolf den or rendezvous locations within the Fourmile Project area that would be affected. If wolf den and rendezvous are located, the sites would be protected through the implementation of the forest plan's standards and guidelines (USDA Forest Service, 2004a).

Kirtland's Warbler (*Dendroica kirtlandii*)

Kirtland's warblers nest on the ground near the lower branches and in large stands of young jack pines that are 5 to 20 feet tall and 6 to 22 years old (USDI Fish and Wildlife Service, 2016a). Female Kirtland's warblers frequently place their nests on the ground at the edge of thickets and openings in these young jack pine stands (Probst, J. R., D. M. Donner, C. Bocetti and S. Sjogren, 2003). The tree's age is crucial, although biologists are not sure why. It is possible that the birds need low branches near the ground to help conceal their nests. Before the trees are six years old, the lower branches are not large enough to hide the nest. After 15 years, these lower branches begin to die (USDI Fish and Wildlife Service, 2016a).

Kirtland's warblers breed in large (>100 acres) stands of young jack pine growing on extremely well-drained soils. The density (>1,200 stems per acre) and patchy distribution of jack pine that comprises suitable habitat regenerates naturally after wildfire (Zou, X., C. Theiss and B. V. Barnes, 1992) and can be mimicked imperfectly by plantations and natural regeneration following site preparation with and without seeding, which can have a similar percent cover of trees but at lower densities than produced by wildfires. Plantations created specifically for Kirtland's warbler breeding habitat have more trees than in stands resulting from standard forestry prescriptions or from the natural regeneration that follows tree harvesting (Probst, J. R. and J. Weinrich, 1993).

In 1967, the FWS added the Kirtland's warbler to the list of endangered and threatened wildlife as an endangered species (USDI Fish and Wildlife Service, 2016b). It was previously only known to be found in Michigan until the summer of 2007 when breeding was documented in south-central Wisconsin. Since that time this area has continued to document returning males and successful nesting (USDI Fish and Wildlife Service, 2016c). In 2008, there was Kirtland Warblers documented approximately 20 miles to the SE of the project area in Marinette County. Yearly surveys at this location have also continue to document either singing males and or successful productivity (Halfmann, 2016).

The most suitable Kirkland's warbler nesting habitat for the CNNF is on the Washburn Ranger District (WRD) which is located in Bayfield County. More than 3,000 acres of suitable patches of young jack pine were surveyed here for Kirtland's warblers in 2007 and 2008. Two Kirtland's warblers were observed together however other surveyors attempting to verify the sightings failed to detect the birds on subsequent visits. In 2009, approximately 5,500 acres were surveyed, including four separate surveys at the site in which Kirtland's warblers were observed in 2008 with no positive observations. In 2014 and 2015, approximately 3,600 acres were surveyed for Kirkland's warblers with no birds seen. Survey continued in 2016 with 1,000 acres surveyed and 2,900 in 2017 with no detections of birds. These surveys will continue in suitable habitat on an annual basis but no Kirtland's warblers have been detected since 2008 (Heeringa, 2018).

There has been no documented observations of Kirtland warblers on the ER/FL RD. There was one unconfirmed report in the mid 2000's on private lands in the NW section of the District (NW Howell EIS). This observation was never confirmed and since then there has not been any other observations at this site or any other locations on the ER/FL RD. There are 6 stands of jack pine in the Fourmile project area, but all are unsuitable due to being older than the suitable habitat age parameters.

Therefore, in the project area under all alternative the proposed activities are anticipated to have no effect on Kirtland's Warblers or its habitat because it is not known to occur in the project area and has no suitable habitat.

Determination (All Alternatives):

No Effect. No Kirtland warblers or suitable habitat for the bird has been identified in the project area. There are stands of jack pine within the project that would be treated; however, these stands are small and not situated within a suitable habitat complex that would be considered appropriate Kirtland's Warbler habitat. Adding this impact onto past, present, and reasonably foreseeable actions embodied in the Nicolet National Forest analysis no additional effects would be experienced; thus, no measurable cumulative effects exist and as a result no further analysis is warranted.

Canada Lynx (*Lynx canadensis*)

Canada lynx are closely associated with the distribution of the northern boreal forest (USDI Fish and Widlife Service, 2000). In Canada and Alaska, lynx inhabit the classic boreal forest ecosystem of the Taiga but lynx in the contiguous United States are at the southern periphery of their range and are associated with the boreal forest populations of central Canada (USDI Fish and Widlife Service, 2000).

Canada lynx have never been common in Wisconsin. Northern Wisconsin forms the southern edge of their historic range. A breeding population may have existed in the state, but declined as trappers caught lynx for the fur trade and loggers and settlers destroyed the northern forests (WDNR, 2016a). In addition, lynx suffered from the prevailing prejudice against predators like the wolf. Beginning in 1865, a state-financed bounty encouraged the killing of lynx. It is thought that by the early 1900s, lynx no longer bred in Wisconsin, however, the bounty was not lifted until 1957 (WDNR, 2016a). Since 1900, lynx sightings in Wisconsin have correlated directly with the low points in the 10-year cycles of snowshoe hares in Canada. When snowshoe hare populations crash, lynx migrate south through Minnesota into Wisconsin in search of prey. The primary diet of the lynx is snowshoe hare (*Lepus americanus*), comprising 35-97 % of the species diet throughout its range (USDI Fish and Widlife Service, 2000). Other prey includes red squirrels, grouse, and an assortment of other forest mammal species (USDI Fish and Widlife Service, 2000). Because primary prey species such as the snowshoe hare are cyclic in abundance, other prey species become important during low cycles when hare or grouse are scarce. In northern regions, when hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased kitten survival.

In Canada and Alaska, lynx populations experience extreme fluctuations in response to snowshoe hare population cycles, enlarging or dispersing from their home ranges and ceasing the recruitment of young into the population after hare populations decline (USDI Fish and Widlife Service, 2000). In the southern part of its range, lynx appear to be naturally limited by the availability of snowshoe hare, as suggested by large home ranges size (8 to 800 square kilometers) and the capacity to disperse over long distances. In the Great Lakes geographic area, population dynamics in recent decades appear to be strongly driven by immigration from Canada (USDI Fish and Widlife Service, 2000). It is likely that some areas in the southern periphery act as source populations and some areas act as sinks for the species. Sink habitat are most likely those areas on the periphery of the southern boreal forest where habitat becomes more fragmented and more distant from larger lynx populations (USDI Fish and Widlife Service, 2000).

The Canada lynx was listed by the USDI in 2000 as a threatened species under the Endangered Species Act of 1973 (as amended). During this period, the CNNF initiated an analysis of potentially suitable habitat and field surveys using the National Lynx Conservation Assessment protocols (Weiland, 2002). These field surveys were conducted to assess the presence of the species on CNNF lands (Weiland, 2002). The results of this analysis and field survey concluded that lynx were not present and that suitable habitat for the species did not exist. Since that analysis, lynx have been documented as present and breeding on the Superior National Forest in northeastern Minnesota and another lynx was captured near Trout Lake, Michigan during the winter of 2003-04 in the eastern portion of Michigan's Upper Peninsula (these areas contain much larger amounts of boreal or boreal-like forest than exists on the CNNF). Additionally, based on review of harvest records of lynx in Ontario, Canada, it appears that lynx populations in the Great Lakes are at the highest levels in over a decade and likely explains the recent appearance of lynx in upper Michigan and northern Minnesota (USDI Fish and Widlife Service, 2000).

Based on this, the FWS indicated in a Consultation Letter to the CNNF in March 2004 (Letter from Janet Smith FWS, State Supervisor to Anne Archie, Forest Supervisor) for the revised forest plan, that any lynx in Wisconsin and on the CNNF:

- Are likely to be animals dispersing from source populations in Minnesota and Canada
- Are not anticipated to become residents in any particular area of the Forest or State
- Would benefit from the forest plan's emphasis on increasing interior forest habitats, increasing patch sizes, and increased emphasis on roadless and non-motorized areas
- Would have most suitable habitats in lowland conifer types that are not proposed for vegetative management actions under the forest plan (USDA Fish and Wildlife Service, 2000)

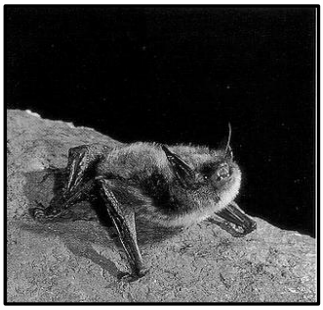
This indicates that any lynx found in Wisconsin is likely a transient animal that is unlikely to establish itself in the state and the CNNF. This is further supported by the fact that since completion of the CNNF's 2000 analysis, additional snow tracking efforts by the WDNR and the CNNF, in areas with possible lynx sightings failed to locate any information that confirmed lynx are present in the CNNF. Since the winter of 2006, over 5,000 miles of winter carnivore surveys were conducted across 19 northern Wisconsin counties with zero lynx detected. The CNNF, working with the WDNR, continues to follow up on reports of lynx in the CNNF or the state in an attempt to confirm if lynx are present. So far, these reports have not resulted in confirmation of lynx presence.

Therefore, in the project area under all alternative the proposed activities are anticipated to have no effect on Canada Lynx or its habitat because it is not known to occur within the CNNF and the project does not impact any lowland conifer, the most suitable forest type for lynx.

Determination (All Alternatives):

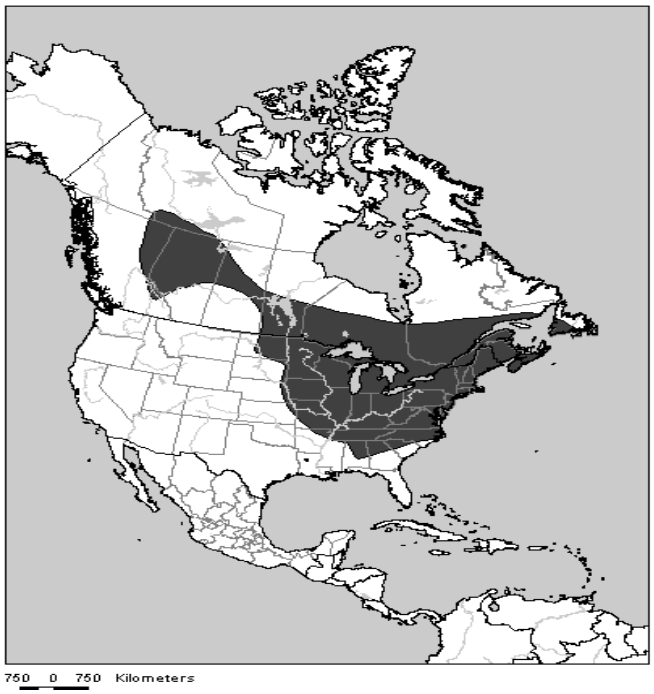
No Effect. No lynx have been found or are known to reside within the Fourmile project. An analysis of suitable lynx habitat (Weiland, 2002) didn't find any suitable lynx analysis units (LAUs) on the CNNF. Hence, any lynx found here are considered by the USFWS and the CNNF to be transients. Adding this impact onto past, present, and reasonably foreseeable actions embodied in the Nicolet National Forest analysis no additional effects would be experienced; thus, no measurable cumulative effects exist and as a result no further analysis is warranted.

Northern Myotis (Myotis septentrionalis)



The northern long-eared bat (NLEB) or northern myotis (formerly identified as a subspecies of *Myotis keenii*), is a predominately northern bat, living in forested areas. Although this species is widespread it may be irregularly distributed or patchy. It can be found across eastern North America from Manitoba across southern Canada to Newfoundland, south to northern Florida, west through the south central states and northwest to the Dakotas (Figure 4) (Bat Conservation International, 2016)Northern long-eared bats are found in forested areas, especially in mature forests of oak, hickory, maple, hemlock, or birch (Bat Conservation International , 2001). During the winter months, this bat will hibernate in caves, abandoned mines, and rock crevices either singly or in very small groups. Hibernation counts rarely exceed 100 individuals for this species. These bats will also typically choose cooler hibernation sites than the little brown bat and the tri-colored bat. During the summer, female NLEB bat will form maternity colonies of 1 to 99 individuals while most males and non-reproductive females appear to be nomadic selecting cooler roosts, either living alone or in small groups. Both sexes intermingle again in late summer as they make their seasonal movements to swarming and hibernation sites (Bat Conservation International , 2001). Maternity colonies have been found in such places as snags, tree crevices and cavities, live trees, beneath exfoliating bark, in attics, under wooden shutters and shingles, in expansion joints of bridges, and bat houses. In Michigan, NLEB were observed roosting in crevices, in hollows, or under the bark of maple (*Acer saccharinum*) and ash (*Fraxinus pennsylvanica*; (Thompson, 2006). Lactating females were found to switch roosts every 2 to 5 days, and individuals within the colony frequently may alternate their roost trees and association with other females of the group (Thompson, 2006). Forest management that maintains existing large snags and provides large trees for future snags should benefit NLEB.

Figure 4: North American Distribution of the NLEB (Nature Serve, 2016a).



Little is known about the food habits of the NLEB however this bat is a relatively slow flier that is well adapted to foraging in a cluttered environment. Considered a gleaner and occasional aerial hawker, these bats are able to take prey directly from foliage or on-the-wing. Based on available observations the NLEB is thought to forage exclusively beneath the canopy level, often 1 to 3 m above the ground along forested hillsides and ridges (Bat Conservation International , 2001), nonriparian woodlands characterized by a “cluttered” sub-canopy layer, as well as canopy gaps and forested areas characterized by open understories and low density where they can capture prey items moving on foliage (Thompson, 2006). An opportunistic insectivore, prey consists of both flying and non-flying insects, including moths and lepidopteran larvae, beetles, flies, midges, mosquitoes, caddisflies, spiders, and leafhoppers.

NLEB appear to make only local seasonal movements (Bat Conservation International , 2001). Their apparent ability to utilize a relatively wide range of hibernation sites may allow them to travel less than other species. Prior to hibernation these bats will join several other species in swarming at cave and mine entrances as early as late July and August. Mating typically occurs before the onset of hibernation in September and October and potentially extends into the spring. The hibernation period can last as long as 8-9 months in northern latitudes. Fertilization occurs as females emerge around late April through May with birth occurring from June to mid-July. The single pup born to the female is nursed for up to 34 days with adult-like flight observed as early as 3 weeks. Unlike many colonial species, the births of NLEB are not closely synchronized within a colony and little is known about the early development of offspring (Bat Conservation International , 2001). These bats have been documented living up to 19 years, though most probably have shorter life spans. No consistent predators were noted, but similar to the little brown bat, a variety of predators likely feed opportunistically on the NLEB including owls, raccoons, snakes, and domestic cats.

Although much still has to be learned about the maternity and winter habitat requirements of this species, initial information on summer habitat indicate the species utilizes a wide variety of forested/wooded habitats where they roost, forage, and travel, and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. The NLEB typically uses mature, intact interior forest for roosting, though younger, managed forests are also used; roost selection is likely adaptable and variable depending on forest characteristics in an area (Broders, H.G., G.J. Forbes, S. Woodley, and I.D. Thompson, 2006), (Carter, T. and G. Feldhamer, 2005), (Ford, W.M., S.F. Owen, J.W. Edwards, and J.L. Rodrigue, 2006), (Henderson, L.E., L.J. Farrow, and H.G. Broders, 2008), (Lacki, M. and J. Schwierjohann, 2001), (Loeb, S.C. and J.M. O’Keefe, 2006), (Perry, R. and R. Thill, 2007). Roosting site characteristics and tree species vary by geographic location.

Silvis et. al. (2012) suggested that while upland positions may increase solar radiation at roost sites, such sites also have the highest natural disturbance frequency and severity; thus, increased snag presence rather than increased solar radiation might be the primary influence on NLEB roost selection. This could also potentially explain higher use of trees in wetlands and floodplains, where high water often results in high snag densities.

Similar to the variation in landscape characteristics, many studies suggest that NLEB use a variety of tree species for roosts based largely on the tree species’ proportional availability on the local landscape, roosting in the types of trees in an area that offer the necessary structural characteristics (Foster, R. and A. Kurta, 1999), (Krynak, 2010), (Menzel et. al (2002), (Sasse, D. and P. Pekins, 1996), (Schultes, 1993).

In studies of relatively mature forested habitat, female NLEB roosts (particularly maternity roosts) were often in large, taller trees in mid-late decay class, located in localized areas with more open canopy and more abundant snags as compared to other areas (Broders, H.G. and G.J. Forbes, 2004), (Garroway, C. and H. Broders, 2008), (Lacki, M. and J. Schwierjohann, 2001), (Sasse, D. and P. Pekins, 1996).

Most recently a study in Wisconsin found NLEB to roost in red oak, red and sugar maple, aspen, white oak, white and ash, black locust and black walnut (WDNR, 2015). These trees most often had the largest dbh (diameter breast hight) and were equally likely to be alive or dead.

Regardless of geographic and topographic location, maternity roost sites must provide warm microclimates that maximize growth rate of the young. O'Keefe (2009) found that mean plot canopy closure for female roosts (43%) was much lower than values reported in previous studies, possibly due to the prevalence of canopy gaps in mixed oak forests in the study area in western North Carolina; Johnson et. al. (2009) also frequently found NLEB roosting in trees in canopy gaps. A Wisconsin study of four forested sites indicated that the mean roost canopy cover was approximately 43% (WDNR, 2015). O'Keefe (2009) found that several microhabitat factors were important for roost site selection by reproductive females (roosts were generally large diameter canopy trees with low canopy closure and in close proximity to other suitable roosts), while males were more flexible, typically selecting a cavity in a small diameter live-damaged understory or mid-story roost tree. Male and non-reproductive female summer roost sites also may be in cooler locations, including caves and mines. Maternity colonies have been reported in tree cavities, crevices, under exfoliating bark, in live trees, and in bridges as well as buildings and bat boxes (Foster, R. and A. Kurta, 1999), (Menzel et. al. (2002), (Felderhamer et. al. (2003), (Henderson, L. and H. Broders, 2008) and (Krynak, 2010).

A Wisconsin study of four forested sites indicated that the mean roost canopy cover was approximately 43 percent (WDNR, 2015). O'Keefe (2009) found that several microhabitat factors were important for roost site selection by reproductive females (roosts were generally large diameter canopy trees with low canopy closure and in close proximity to other suitable roosts), while males were more flexible, typically selecting a cavity in a small diameter live-damaged understory or mid-story roost tree. Male and non-reproductive female summer roost sites also may be in cooler locations, including caves and mines. Maternity colonies have been reported in tree cavities, crevices, under exfoliating bark, in live trees, and in bridges as well as buildings and bat boxes (Foster, R. and A. Kurta, 1999), (Menzel et. al. (2002), Feldhamer et.al. (2003), (Henderson, L. and H. Broders, 2008), and (Krynak, 2010).

This species occurs across most of Wisconsin, including the CNNF Forest. NLEB are found in most caves and mines surveyed in Wisconsin, although typically in low numbers. Population trends are likely declining due to White-nose syndrome (WNS). This previously unknown psychrophilic (cold-loving) fungus (*Pseudogymnoascus destructans*) was first identified in a cave near Albany, NY in 2006. The affected bats tend to wake more frequently from a hibernating state and as a result deplete vital energy stores needed to survive winter, causing starvation and dehydration. The fungus that causes WNS was first confirmed in SW Wisconsin during the winter of 2013/2014, with additional sites in southern and eastern Wisconsin confirmed in the winters of 2014/2015. In the Upper Peninsula of Michigan, WNS was first confirmed in Mackinac and Dickinson County in 2013/2014. Since that time seven other counties in the Upper Peninsula have documented the presence of WNS.

The CNNF does not contain any known bat hibernacula, but most forested lands could be considered potential roosting habitat not only during the summer/maternity period but also during the spring and fall migratory periods. The closest hibernaculum to the Chequamegon landbase are located in northern Wisconsin ranging from approximately 10 to 50 straight line miles from the Forest boundary. The closest one to the Nicolet landbase are in Dickinson County which borders the ER/FL RD to the north and is approximately 30 miles from the Fourmile project area.

WDNR 2015 and net surveys conducted since 2006 have documented the presence of NLEB on all five Ranger Districts. Additionally, the CNNF is actively contributing to joint inventory and monitoring efforts to evaluate summer bat population trends. The data collected on 17 mobile acoustic monitoring routes, some since 2009, were analyzed and those results presented in the 2015 report "Bat Acoustic Analysis CNNF 2009-2014" (WEST, Inc., 2015). This data has allowed the CNNF to identify baseline bat activity levels and observe how those levels potentially change in response to the arrival of WNS. The CNNF is expecting to continue with mist netting and acoustic transects in 2016. The CNNF is also working in partnership with the WDNR and other partners to increase knowledge of NLEB distribution and habitat use in northern Wisconsin. Surveys have not been completed in all portions of the CNNF, but presence is assumed based

on relatively widespread distribution of mist net survey observations and the presence of potential summer habitat in the project areas.

Current ranking population status for NLEB at the state, federal and global level are listed below.

Wisconsin State Status: Threatened

Wisconsin State Rank: **S1S3** – Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation from the state. Rare or uncommon in Wisconsin (21 to 100 occurrences).

Global Rank: **G2 –** Imperiled. Large range in the eastern and north-central United States and much of southern Canada; most abundant in the northern part of the range but relatively rare rangewide both in terms of hibernacula and in summer foraging and maternity areas; frequently comprises less than 10% of the bat community. Significant recent declines associated with rapidly spreading WNS have occurred in eastern North America, and some habitat has been lost, degraded, or fragmented, primarily through the disturbance of hibernacula and land development. Mortality caused by bat collisions with wind turbines is expected to increase (NatureServe 2015).

Federal Status: **FT**: On April 2nd, 2015, the US FWS made a final decision to list the NLEB as Federally Threatened with a species-specific rule under section 4(d) of the Act excepting specific forms of take.

Prior to 2006, the foremost factor leading to population declines was unwarranted destruction of roost sites, particularly hibernacula. Widespread recreational use of caves and indirect or direct disturbance by humans during the hibernation period poses the greatest known threat to these species. Bat conservation efforts have therefore focused primarily on protecting hibernacula from vandalism and physical alterations. Food chain poisoning by the use of particular insecticides, such as organochlorines and anticholinesterase, is a secondary factor demonstrating negative impacts on insectivorous bats.

Most recently however, no other threat is as severe and immediate for the NLEB as the disease WNS. It is unlikely that NLEB populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2007 (later biologists found evidence from 2006 photographs), WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast (Figure 5). Population numbers of NLEB have declined by 99 percent in the Northeast, which along with Canada, has been considered the core of the species' range. Although there is uncertainty about how quickly WNS will spread through the remaining portions of these species' ranges, it is expected to spread throughout their entire ranges. In general, the FWS believes that WNS has significantly reduced the redundancy and resiliency of the NLEB.

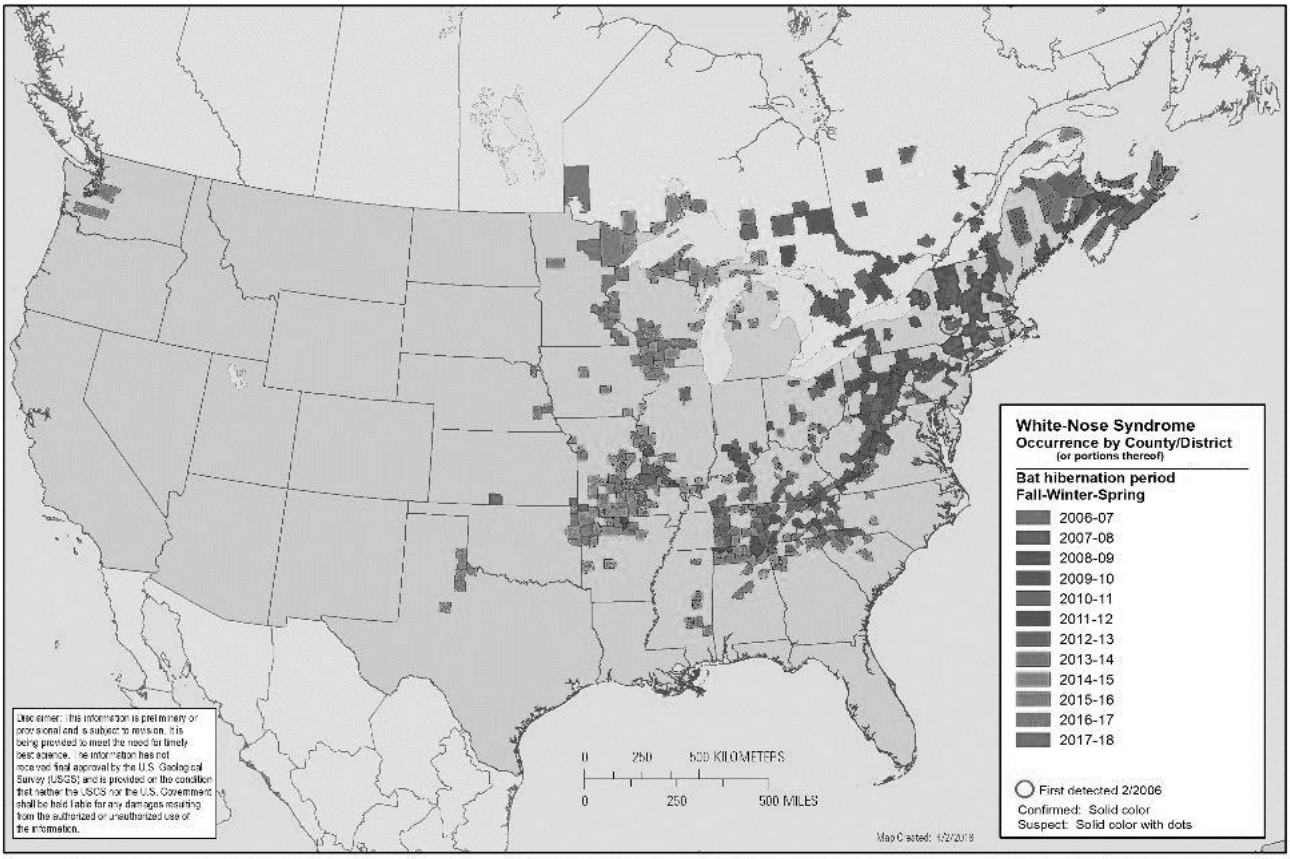


Figure 5. White nose syndrome (WNS) occurrence by County and Province 4/03/2018.

Although significant NLEB population declines have only been documented due to the spread of WNS, other sources of mortality could further diminish the species' ability to persist as it experiences ongoing dramatic declines. Specifically, declines due to WNS have significantly reduced the number and size of NLEB populations in some areas of its range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual NLEB sickened or struggling with infection by WNS may be less able to survive other stressors. Second, NLEB populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less able to recover making them more prone to extirpation. The status and potential for these impacts will vary across the range of the species.

Females that survive the migration to their summer habitat must partition energy resources between foraging, keeping warm, successful pregnancy and pup-rearing, and healing and may experience reduced reproductive success.

Over the long-term, sustainable forestry benefits NLEB by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on the NLEB depending on the quality, amount, and location of the lost habitat, and the time of year of clearing. Depending on their characteristics and location, forested areas can function as summer maternity habitat, staging and swarming habitat, migration or foraging habitat, or sometimes, combinations of more than one habitat type. Impacts from tree removal to individuals or colonies would be expected to range from indirect impact (e.g., minor amounts of forest removal in areas outside NLEB summer home ranges or away from hibernacula) to minor (e.g., largely forested areas, areas with robust NLEB populations) to significant (e.g., removal of a large percentage of summer home range, highly fragmented landscapes, areas with WNS impacts).

It should be noted although, that on the CNNF, no bat-accessible mine openings, caves, or other structures that could be used for fall swarming or winter hibernation habitats are known to exist. Thus, the spread of WNS and disturbance of winter hibernacula is not an issue. However, CNNF management actions that

could be considered threats to the bats are associated with disturbance of summer roosting and foraging habitat.

Surveys

Bat monitoring actively began on the CNNF in 2006 with the initiation of summer absence/occurrence mist net surveys on the Medford-Park Falls landbase. Since then a different district has been surveyed each year between the months of June and August. With the completion of surveys on the Lakewood-Laona Ranger District (LK/LA RD) in 2010 the first round of surveys has been accomplished. The second round began in 2011 and will continue into the future with each district being revisited approximately every 2- 5 years. In addition to mist-netting, site specific absence/occurrence acoustic surveys began in 2008, and in 2009 a Region-wide acoustic monitoring program was initiated across Forest Service Regions 8 and 9 in response to WNS. Since the inception of this program the CNNF has remained actively involved with over 12 established survey routes and a representative serving on the three-member Eastern Region Acoustic Centers of Excellence team. These acoustic transects are completed using a bat detector placed on the roof of a vehicle. The vehicle is then driven on a 30 mile transect, no faster than 20 mph. These transects, usually two per District, are run a minimum of three times per season. The collected acoustic recordings are then analyzed. In addition to gathering valuable bat species absence/occurrence data across large portions of the landscape, it will allow the CNNF to identify baseline bat activity levels for areas currently unaffected by WNS and a means to observe how those levels change in response to the arrival of WNS.

The Forest additionally maintains and monitors over 100 bat houses across all five Ranger Districts. These bat houses are typically monitored a minimum of once per year between May and August.

Acoustic transects surveys were conducted each year within the project area from 2010 to 2016. However, the data from the past two years are currently being analyzed. Acoustic recordings were conducted on approximately 13 miles of roads within the project area (Table 13). No northern long eared bats were recorded in the project area.

Table 13. Summary of Anabat acoustic transects survey results for Fourmile project area 2010-2014.

		Number of Anabat Files										
Year	MYSE	MYLU	EPFU	PESU	LACI	LABO	EF_LN	LB_ML	LF	HF	Myotis	TOTAL
2010	0	35	3	0	0	2	8	0	1	8	0	57
2011	0	50	3	0	0	3	5	1	0	9	1	72
2012	0	45	0	0	1	7	3	2	1	7	1	67
2013	0	30	1	0	5	6	2	5	0	8	0	57
2014	0	25	0	0	17	5	7	3	1	11	0	69
	0	185	7	0	23	23	25	11	3	43	2	322

HFG = High Frequency Group - ≥35 kHz (Myotis lucifugus, Myotis septentrionalis, Lasiurus borealis, Lasiurus cinereus, and Perimyotis subflavus); LF= Low Frequency Group - <35 kHz (Lasiurus cinereus, Lasionycteris noctivagans, and Eptesicus fuscus); LABO = Lasiurus borealis; LACI = Lasiurus cinereus; MY = Myotis species including Myotis lucifugus and Myotis septentrionalis; EF_LN = Eptesicus fuscus or Lasionycteris noctivagans; MYLU = *Myotis lucifugus;* LB_ML = Lasiurus borealis or Myotis lucifugus; MYSE = *Myotis septentrionalis* LB_PS = Lasiurus borealis or Perimyotis subflavus;

Each file does not necessarily represent a single or individual bat record. The chances that the same bat is recorded multiple times is unlikely in most cases due to the transect are being driven at or over 20 mph, but multiple times can never be completely eliminated. However, the survey and data does show a good presence/absence occurrence and indicates that this part of ER/FL has a good representation of Wisconsin bat species.

Threshold of Effects

In the 2015 US FWS Biological Opinion for Activities Affecting the NLEB on Eastern Region National Forests, suitable summer habitat for the NLEB generally focuses on locations selected for day-time roosting. In a forested setting these locations are generally trees. Several studies of the species' summer ecology focus on the characteristics of these trees and their locations in the forested landscape. NLEB typically roost singly or in colonies underneath loose bark or in cavities or crevices of both live trees and snags (Sasse, D. and P. Pekins, 1996), (Foster, R. and A. Kurta, 1999), Owen et. al. (2002), (Carter, T. and G. Feldhamer, 2005), (Perry, R. and R. Thill, 2007) and (Timpone et. al. (2010). NLEB colonies have also

been observed roosting in structures, such as in buildings, in barns, on utility poles, behind window shutters, and in bat houses (Mumford, R.E. and J. B. Cope, 1964), (Sparks, J., B. Foster, and D. Sparks, 2004), (Whitaker, J.O., and R.E. Mumford, 2010), and (Timpone et. al. (2010).

Summary of NLEB foraging requirements are shown in Table 14 along with roost tree characteristics, which are detailed below.

- *Roost Tree Species*: Roost trees consisted predominantly of hardwoods (e.g., (Foster, R. and A. Kurta, 1999), (Lacki, M. and J. Schwierjohann, 2001), (Broders, H.G. and G.J. Forbes, 2004).
- Data suggests that hardwood trees most often provide the structural and micro-climatic conditions that maternity colonies prefer, which have more specific roosting needs than solitary males (Lacki, M. and J. Schwierjohann, 2001).
- *Live Trees and Snags*: While most studies indicate that NLEB use dead or dying trees more often than live trees, a recent Wisconsin study indicated that it was equally likely for NLEB to roost in live or dead trees. This could suggest that as long as the tree can provide the structural characteristics preferred for roosting, NLEB can utilize it.
- *Roost Tree Size*: While the dbh (diameter at breast height) of about 80% of 400 documented maternity roosts was in the range of 4 to 11 inches, the USFWS considers potential roosts to be live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities.

Table 14. Summary of species-specific foraging and roosting requirements for the northern long-eared bat

Activity	Northern Long-eared Bat
Roost Trees	Live or dead tree; cavity, crevices, and (under bark); tree in gap not required
Use of manmade roosts	Yes, but less than trees: bat boxes, sometimes buildings
Roost Tree Species	Oak, maple, ash, aspen understory spp.
Roost Tree Habitat	Upland forest
Roost Area Fidelity	Yes, but with frequent roost switching within an area
Foraging Habitat	Cluttered conditions under forest canopy in uplands: paths, edges, harvest areas
Foraging Strategy	Gleaner & aerial hawker

Analysis Assumptions

Based on the above information and for the purposes for this analysis, it was assumed that all forest types greater than or equal to 3-inch dbh and more than 10 years old could be considered suitable summer roosting habitat. In addition, this analysis assumes that foraging habitat would not be limiting, regardless of proposed harvest treatments.

This unlimited foraging habitat assumption is based on the literature which describes foraging habitat as "…(foraging has been observed) exclusively beneath the canopy level, often 1 to 3 m above the ground along forested hillsides and ridges (Bat Conservation International , 2001), non-riparian woodlands characterized by a "cluttered" sub-canopy layer, as well as canopy gaps and forested areas characterized by open understories and low density where they can capture prey items moving on foliage (Thompson, 2006). Other observations have shown the bat foraging along forest edges, over forest clearings, at tree-top level, and occasionally over ponds (Bat Conservation International , 2001). Thus, given this foraging habitat description, removal of the canopy by the proposed treatments would not impact the availability of foraging habitat for the northern long-eared bats.

Determination of Effects

No bat-accessible mine openings, caves, or other structures that could be used for fall swarming or winter hibernation habitats are known to exist on the CNNF. Thus, there is no direct impact to the winter hibernacula. However, project proposed management actions or treatments may be considered an indirect impact or threat to the preferred summer roosting habitat and would include the following:

Treatment	Description
Clear-cut	A regeneration harvest method that removes essentially all the live overstory trees in a stand, except for reserve trees left on site for management objectives other than regeneration. The result is a new age class of trees that grows following the harvest treatment. This method allows for natural regeneration of forest species which are light tolerant. The desired future condition is an even-aged stand, reset to age zero. However, some reserve trees and reserve islands are left in the stand to promote diversity that helps meet objectives in the Forest Plan and Best Management Practices for Water Quality (Water BMPS) from the Wisconsin Department of Natural Resources. Regeneration can be from natural seeding, direct seeding, root suckering, planted seedlings or advance reproduction
Shelterwood/Seed Tree	A regeneration harvest method that removes essentially most of the overstory except to retain a partial live overstory to provide seed and shade for regeneration. Reserve trees are also left on site for management objectives other than regeneration. The result is a new age class of trees that grows following the harvest treatment. The partial overstory that is left would be removed once seedlings and saplings are established (unless stated otherwise).
Shelterwood and Plant	A regeneration harvest method that removes essentially most of the overstory except to retain a partial live overstory to provide seed and shade for regeneration. Reserve trees are also left on site for management objectives other than regeneration. These stands will be underplanted with long lived hardwood and conifer species (white pine, red pine, hemlock, and oak). The result is a new age class of trees that grows following the harvest treatment. In these stands, any live overstory remaining once the seedlings are established will remain on site.
Individual Tree Selection Northern Hardwood	Hardwood stands would be selectively marked for harvest to reduce stand density, remove undesirable tree species, and promote growth on residual trees. In pole size hardwood stands, residual crown closure would be 75-80 %. In sawtimber size stands, residual crown closure would be 80 %. Canopy gaps would be created in all stands to initiate a new age class. Four to eight 25 to 40 foot gaps per acre would be created by harvesting groups of pole sized trees or one to two large crowned trees. Species diversity would be encouraged in stands. Stands with mid-successional species (red oak, white ash, basswood, yellow birch, and black cherry) would be encouraged with one 60-foot gap for every two acres. Following the 2009 Ash Management Strategy for the Forest, selective marking or canopy gap creation would focus on the largest ash in the stand and retained ash would be in the smaller size classes. In stand 154.017 focus would be to improve spruce grouse habitat by keeping spruce, encouraging spruce regeneration, and breaking up thick balsam fir regeneration.
Post-Harvest Activities	Following harvest, some stands will require site preparation, including mechanical and hand scalping treatments, and piling and burning of piles. Planting or seeding to meet regeneration or species diversity objectives are also proposed for some stands. Animal control (deer repellent) and release of planted seedlings are planned for some areas. Temporary roads would be built to access some treatment units and then decommissioned. Slash treatments to reduce fire hazards are planned within certain activity units.

While some of the projects proposed actions may impact the bats species roosting habitat, there are forest plan standards and guidelines that may minimize these impacts and are applied to all alternatives. Though bats are not directly addressed in the forest plan, several of the standards and guidelines (e.g. snag retention and recruitment, reserve areas, permanent forest openings, watershed protection, etc.) deal with many key habitat characteristics and are beneficial to bat species. Additionally, the forest plan has various management areas outlined with differing desired future conditions that are distributed across the CNNF. These management areas, together with the standards and guidelines for management actions and prescriptions for vegetation composition, contribute to a species-rich, diverse, robust, and healthy forest system that can provide for a wide range of wildlife and plant species needs.

Specific standards and guidelines within the Fourmile project that address key roosting and foraging habitat characteristics, are beneficial to bats, and minimize treatment impacts include the following:

- Maintain water quality by following guidelines contained in “Wisconsin’s Forestry Best Management Practices for Water Quality,” (BMPs), March 1995 edition (or subsequent revisions).

- Utilize Wisconsin's Forestry Best Management Practices (BMPs) for riparian management zone categories. Expand riparian management zones wider than those defined in Wisconsin's Forestry BMPs and modify management practices where necessary (e.g., projects on steep slopes and/or highly erodible soils).
- Protect hydrologic function and maintain natural hydrologic regimes.
- Utilize guidelines found in Wisconsin's Forestry BMPs to maintain water quality and hydrologic wetland functions during activities such as timber harvesting or road and trail construction.
- Leave and protect existing downed logs greater than 10 inches in diameter (small end diameter) consistent with providing for management access (e.g. skid trails).
- Exclude heavy logging equipment from wet areas, excessively steep slopes, or reserved areas within timber harvest units.
- Reserve tree guidelines for even-aged managed stands: Reserve the above-listed tree species in small clumps or islands of trees within clearcuts, overstory removal cuts, and other regeneration harvest areas.
- Reserve 2 to 5 live trees per acre greater than 11 inches in diameter or select the largest trees available; and reserve variable size reserve islands/clumps that total up to ½ acre for every 10 acres managed with an even aged harvest.
- Reserve all dead snags and live den trees up to 10 trees/snags per acre, unless they present a safety concern. Emphasize the largest snags and den trees available. Those snags felled for safety reasons should be left on site as coarse woody debris wherever possible. Additional snags will be recruited from live reserve trees.
- Ephemeral ponds smaller than one acre: Do not operate heavy equipment in woodland ponds. Do not allow logging slash in woodland ponds. However, selected trees may be dropped and left in ponds where large woody debris would enhance aquatic habitat. Prohibit the operation of heavy equipment during non-frozen conditions within 15 feet of the normal high-water mark.
- Ephemeral ponds larger than one acre: Do not operate heavy equipment in woodland ponds. Do not clearcut within 50 feet of the normal high-water mark of these ponds. Individual tree timber harvesting may be done within this zone if there is an emphasis on retaining shade trees and large diameter cavity and nest.
- Permanent woodland ponds smaller than one acre: Do not clearcut within 50 feet of the normal high-water mark of these where they are uncommon (less than one per 10 acres). Where they are common, do not clearcut within 50 feet of at least one-third of the ponds. Individual tree timber harvesting can be done within this zone if there is an emphasis on retaining shade trees and large diameter cavity and nest trees adjacent to the pond.
- Permanent woodland ponds larger than one acre: Use "Wisconsin's Forestry Best Management Practices for Water Quality" (1995 or subsequent revisions) including Riparian Management Zone direction, for guidance on protection.
- Retain conifers as reserve trees within aspen clearcuts.
- Reserve 3 to 7 live trees per acre larger than 11 inches. Focus on the largest trees available.
- Reserve tree species such as hemlock, yellow birch, paper birch, red oak, white oak, American beech, white pine, and others that are not well represented in the stand or on the Forests.
- Retain long-lived conifers and hardwoods as reserve trees within aspen clearcuts. Where long-lived trees are not present—retain short-lived conifers if they are available.
- Emphasize the retention of long-lived conifers such as hemlock and white pine (as a component of the reserve live tree numbers). In addition, reserve other tree species that are not well represented in the stand or on the Forests (yellow birch, paper birch, red oak, white oak, American beech, etc.).

Region 9 of the US Forest Service (i.e. the Eastern Region) has developed additional conservation measures that will be implemented with all new projects as applicable (see below). These measures, which were included in a Region wide Programmatic Biological Assessment, were consulted with the USFWS and accepted in the final Biological Opinion (November 2015). These measures are within the authority and jurisdiction of the FS and are designed to minimize adverse impacts to NLEB, as well as other threatened, endangered, and sensitive bat species, and to provide for beneficial management of bat habitat.

Eastern Region Conservation Measures (2015)

- Designate caves and mines that are occupied by bats as smoke-sensitive targets. Avoid smoke entering these caves and mines any time of the year when Threatened, Endangered, or Sensitive (TES) bats are present.
- Within 0.25 miles of known, occupied NLEB hibernacula, timber harvest will be designed to maintain, enhance, or restore swarming, staging, roosting, and foraging habitat. The future desired condition is that these areas will feature structurally complex, resilient forest communities with a continuous supply of snags, culls, cavities, and other quality roosts.
- Application of herbicides and other pesticides will be planned to avoid or minimize direct and indirect effects to known, occupied TES bat hibernacula and maternity roosts
- Before old buildings, wells, cisterns, bridges, and other man-made structures are structurally modified or demolished, they will be surveyed for bats. If TES bat roosting is found, demolition or modification of these structures will not occur when bats are present and the need for alternative roosts will be evaluated.
- Avoid cutting or destroying known, occupied NLEB maternity roost trees unless they are an immediate safety hazard.
- Where needed to provide drinking sources for bats, create small wetlands or water holes

In addition to Forest-specific standards and guidelines and the Eastern Region Conservation Measures, the US FWS published the final species-specific rule pursuant to section 4(d) of the ESA for NLEB (50CFRPart17) which included a list of prohibited activities.

Incidental take of northern long-eared bats outside of hibernacula resulting from activities other than tree removal is not prohibited. Incidental take resulting from tree removal is prohibited if it: (1) Occurs within a 0.25 mile (0.4 kilometer) radius of known NLEB hibernacula; or (2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-meter) radius from the known maternity tree during the pup season (June 1 through July 31).

There are currently no known roost trees or hibernacula within the project area or on the Forest. However, if roost trees are located prior to implementation the above conservation measures and project design criteria adhering to the FWS final 4(d) rule would apply.

Determination of Effects to northern long eared bat

Alternative 1 - No action

Direct and Indirect Effects

Under the No Action alternative, there would be no management; therefore, there would be no direct or indirect impacts to the NLEB or its habitat from timber harvest treatments or other land management actions.

Cumulative Effects

Absent any direct or indirect effects, there would be no cumulative effects.

Determination

No Effect. Since there are no direct or indirect effects, there would also be no cumulative effects on RFSS bats or their habitat.

Alternative 2 - *Action Alternative*

While active forest management can result in impacts to NLEB summer roosting habitat, management can also create, enhance and conserve bat habitat over broad landscape areas. Vegetation management practices that sustain diversity in tree species, tree-size class, and snag-condition are important tools for providing diverse habitats for bats (Lacki, M. and J. Schwierjohann, 2001), particularly as fires and other historic disturbance regimes have been suppressed or altered. Because of the variable spatial and temporal

habitat needs of bats (both within and across species), a heterogeneous landscape is advantageous even for forest interior ("clutter-adapted") species, assuming that the area is predominantly forest (Hayes, J.P and S.C. Loeb, 2007).

The most direct influence of vegetation management on bat populations involves the creation or removal of roost trees. While tree harvest can result in the loss of potential roost trees, adverse impacts can be avoided or minimized through a variety of management practices, including, but not limited to: conservation of riparian zones consistent with LRMPs, leaving snags and other trees that have characteristics associated with known roost trees, and maintaining a basal area of potential roost trees across the landscape consistent with LRMPs (see above Standards and Guidelines).

Direct Impacts - Death/Injury

Risk of death or injury of individual NLEB from timber harvest or other tree removal varies depending on the timing of activities, their location, type of harvest, and extent of the area affected.

The timing of forest management activities greatly influences the likelihood of exposure and the extent of impacts on individual bats and their populations. Female NLEB typically roost colonially, with their largest population counts occurring in the spring or early summer, presumably as one way to reduce thermal costs for individual bats (Foster, R. and A. Kurta, 1999). Although bats may flee their roosts during tree removal, removal of occupied roosts during the active season while bats are present (spring through fall) is likely to cause injury or mortality to some roosting bats.

Bats are also likely to be killed or injured during early to mid-summer (approximately June-July) when flightless pups or inexperienced flying juveniles are present. Removal of trees outside these periods is less likely to result in direct injury or mortality when the majority of bats can fly and are more dispersed.

The likelihood and extent of impacts are influenced by the type of the timber harvest or tree removal relative to the amount of remaining suitable roosting and foraging habitat from which affected bats may select. NLEBs use multiple roosts throughout the season. Therefore, only a certain number of roosts are anticipated to be occupied in a single day or year. Larger areas of treatment have greater risk than when smaller areas are affected. Similarly, clearcuts have greater risk than selective harvest treatments (individual or group) because more trees will be removed in the treatment area.

Considering the different types of harvest, varying levels of tree retention and remaining percentage of canopy cover, roosting trees/sites within areas subject to uneven-age or even-aged management in summer may continue to be suitable for NLEBs during and soon after harvest.

Indirect impacts to summer roosting habitat

In the project area there are approximately 28,783 acres of summer roosting habitat for the NLEB. Summer roosting habitat is defined as any forest type greater than or equal to 3 inch dbh and more than 10 years old (Table 15).

Table 15. Summer roosting habitat proposed for treatment by action alternative (acres).

Roosting habitat in project area	Existing Habitat	Alternative 1	Alternative 2
Upland Hardwood (20,81,82,84,85,89)	13,366	0	5,876
Aspen Types (11,91,93,95)	4,370	0	1,585
Swamp Conifer-Spruce (8,12,14-18)	7,459	0	240
Red Pine (2)	4,194	0	2,484
Low Land Hardwood (71,79)	395	0	0
Total	28,783	0	10,187

The NLEB roosts in dead and dying trees (snags), especially beneath loose bark, in tree cavities and hollows, in crevices left by lightning strikes or in the foliage of living trees. These roosts are required for rearing young (maternity roosts), as migratory stopover sites, and occasionally for hibernation.

Bats move frequently between several roost trees that they have established. This is especially true of maternity colonies, although bachelor colonies also exhibit this behavior. This roost switching may be an effort to avoid predators or parasites or to seek a warmer or cooler roost. For tree roosting bats, switching

could also be tied to the temporary nature of dead and dying trees. If a roost tree becomes unstable or falls, the bats would already know of an alternative roost (Taylor, R., 2006). It is common for bats to return to the same roost tree or group of trees in the same patch of forest in successive years. Thus, a direct impact on bats and summer roosting habitat may occur if an occupied roosting tree is removed. However, there is a low probability of this occurring due to dead or dying trees not typically being a part of harvest activities. Also, bats do establish more than one roost tree in the same patch of forest and these would be available for use.

A majority of the proposed treatments are selection, thinning or improvement treatments (Table 16). These harvest treatments will leave a variety of tree sizes and ages, create small gaps similar to those formed by natural forest disturbances. They will also maintain diverse forest structure and roost trees, while creating small gaps and enhancing edge habitat for foraging. It also can promote diverse vegetation structure and some increases in herbaceous vegetation, favorable to production of bats' insect prey. Even-aged methods (shelterwood, salvage and clear cuts) that are used to regenerate forest habitat through several harvest treatments which can alter summer roosting habitat with both negative and beneficial effects. In the short-term, even-aged methods can reduce canopy cover, which can reduce suitable roosting conditions in large openings for up to 20-30 years after entry. However, residual trees in the resulting open condition of an even-aged harvest are also subject to increased solar radiation, which increases the suitability of any given tree to becoming a suitable bat roost tree.

Table 16. Acres of roosting habitat impacted by proposed treatment.

Treatment	Alternative 1	Alternative 2
Clearcut	0	1,198
Shelterwood Cuts	0	6
Overstory removal	0	216
Individual Tree Selection Cuts	0	5,608
Thinning Cuts	0	2,829
Improvement Cuts	0	263
Salvage	0	67
Total	**0**	**10,187**

Roost trees are often located along the edges of forests or in open forest stands, where they generally receive greater solar heating and have a less obstructed flight approach. The structural characteristics of a dead tree – height, diameter, stage of decay ("decay class"), and its position in the stand and on the landscape appear to be the most important factors in determining its suitability as a roost site. These factors affect the roost's temperature, an important component in roost selection. The species of the tree is important only as it relates to these structural attributes. Tree species that are more susceptible to fungal infestations attract cavity excavators such as woodpeckers. Also, those that retain bark for longer periods are more likely to provide appropriate roosting spaces. For this analysis, we assumed that trees greater than 60 years of age in upland northern hardwood and pine-hardwood forest stands would contain the optimal or preferred roosting trees. Bats that roost under the bark or in crevices and cavities of dead trees frequently select the largest available snags, which often extend above the forest canopy. This is especially true for roosts of maternity colonies, since larger snags can better retain the sun's warmth, which benefits the pups. Unproductive females and males often roost alone or in bachelor colonies and appear to use a wider range of snag sizes. Some of the forest bats that roost under bark, in cavities or in lightning-strike crevices in dead trees also use these same features in healthy living trees or those that are damaged or dying. Roosts are often considered the most important habitat component, and roost switching appears to be essential for most species. The most important action land managers can take to maintain bat populations is to provide a continuous supply of potential roost trees (Taylor, D., 2006). These include snags in various stages of deterioration (especially those in early stages of decay), hollow trees, and the green and dying trees that can provide future snags. A majority of the treatments are shelterwood cuts that would open up the canopy allowing increased sun light (heat) on existing trees enhancing roosting habitat.

The exact number of roost trees needed to maintain forest-bat populations is unclear and likely varies by forest type and region. Bats that use live trees can find roosts in most forests, but managers need to ensure that enough dead and dying trees are left for the species that depend on them. Bats need multiple

roosts, and because snags are a short-lived resource, the availability of suitable roost trees for snag roosting bats fluctuates over time. Older, more mature forest stands produce more snags, so well distributed, variably sized patches of mature and old growth forest should be maintained where possible. Natural fall rates would eventually reduce snag numbers unless new snags develop naturally or man-made. Leaving as many large green or cull trees as possible as "leave trees" to become future snags is preferable. Cull trees include those with broken tops, forked tops, wounded areas or other defects that reduce their commercial value. Project standards and guidelines address many of these issues of future roosting in reserve tree criteria.

Snags, den and other trees beneficial to NLEB would continue to be left based on Forest Plan Standards and Guides.

- Reserve 2-5 live trees per acre greater than 11 inches dbh, reserve all dead snags and live den trees up to 10 trees/snags per acre and reserve islands/clumps that total up to ½ acres for every 10 acres managed with an even aged harvest.

While the proposed project has the potential to impact 55% of the roosting habitat, many of the project standards and guidelines address current retention of snags and future creation of snags for summer roosting trees. While individual summer roost trees may be harvested, possibly affecting some bats and habitat, it is anticipated that the remaining trees in a similar patch of forest would provide adequate opportunities to roost. Some of the reserve trees that are required in the proposed actions to be left on the landscape are retained for future growth. Those trees may potentially create large maternity-grade snags when they die. New herbaceous or herbaceous/shrub openings are sometimes created through these harvest treatments.

Road management activities have the potential for direct and indirect effects to RFSS bats through the removal of suitable roost trees and temporary alteration of foraging habitat, which are both discussed in the above section related to harvest treatments. The primary difference here is that in certain circumstances connected actions have a higher likelihood of permanently removing undetected occupied roost trees due to less flexibility in the placement of these features on the landscape because of requirements to protect non-biological resources (e.g., steep slopes and erodible soils) and to meet other needs, such as engineering considerations. Conversely, these activities, particularly temporary skid road/trail construction, can also create beneficial conditions for foraging bats. The temporary skid roads and trails are typically narrow and linear, and the forest canopy is usually retained or partially retained. RFSS bats are known to exploit linear habitat features, such as roads, trails, streams, and forest edges as travel corridors and foraging habitat, especially if water sources are located nearby (USDI Fish and Wildlife Service, 2007). Log landings may provide relatively small canopy openings that would be suitable for foraging or increase solar radiation to potential roost trees along the edge. These activities would open the canopy and understory, thereby moving localized conditions closer to that of optimal foraging habitat. Typically after activities are complete, these landings and temporary roads are closed off to vehicular travel and left to revert to a forested state. Generally, the temporary, short-term loss of this habitat is small in comparison to the adjacent forested landscape and is further minimized by the creation of flight corridors and the long-term enhancement of roosting and foraging habitat.

Road management within bat roosting and foraging habitat would have the same results with all action alternatives in the following areas: 111 mile of decommissioned roads, 39.5 miles of open roads that would be closed, and 1.0 miles of new construction. There would be no effect from any alternative's road management activities due to the limited amount of this work occurring in bat habitat.

Table 17. Proposed road management in Fourmile bat roosting habitat.

Road Management Proposal	Miles
Add to system as Closed Road	**9.8**
Convert closed road to Trail	37.1
Convert open road to Trail	2.0
Decommission	**110.9**
Make road Closed to public	**1.0**
Make road Open to public	0.4
New Construction, add to system closed	**1.0**
No Action, Closed to public	18.2
No Action, Open to public	74.8
Reconstruct for sale then close	**28.7**
Reconstruction of open system road	6.5
Temp Access	0.2
Totals	**290.6**

Cumulative Effects

The cumulative effects for the NLEB are summed up in the "NLEB Biological Assessment for the CNNF Batched Vegetation and Prescribed Fire/Fuels Reduction Management Projects (BVMP) 2003-2015 (pg. 15-18). Where it was determined that "there are 1,619,019 acres of potentially suitable summer roosting habitat inside the National Forest's exterior boundary and an additional 1,555,693 acres of suitable habitat on state and private lands outside but within five miles of the National Forest Boundary. This provides an estimated 3,174,712 acres of suitable NLEB summer roosting habitat on all lands within and a five-mile buffer of and including lands within the CNNF exterior boundary. Of the over 3 million acres of potentially suitable summer NLEB roosting habitat on these lands, approximately 1,104,325 acres of habitat is estimated to be treated in some way from on-going vegetation projects on the Forest. This cumulatively would result in indirect effects to 35% of all potentially suitable summer roosting NLEB habitat if all projects were to occur simultaneously across this area. Because these projects take long periods to plan and implement, and because this does not account for in-growth of stands previously treated that would become 10 years old or greater during the implementation period, the actual cumulative effect to NLEB from these projects is anticipated to be less than the effects described here."

On non-FS lands inside and adjacent to the project area, there are about 6,360 and 11,254 acres of habitat that may be suitable foraging and roosting respectively (Table 4 and Table 5). In that same area, harvest on MFL lands over the past 15 years totals 950 acers (0.07 % of total) and there is about 1,915 acres (0.14 % of total) of harvest planned in bat roosting habitat. All of this timber management on non-Forest lands may alter available NLEB summer roosting habitat but a very low percentage of the total habitat available. Additionally, based on the same rationale discussed above on Federal lands and that NLEB habitat is abundant and well distributed within the Forest, we anticipate that harvest activities on non-Forest lands will result in minimal cumulative effects to the species or its habitat.

Determination

May affect, likely to adversely affect but not result in jeopardy. The proposed actions in the Fourmile project are likely to adversely affect individuals in stands roosting from summer harvesting, assuming that the species is present in the affected stands. However, this level of impact is not likely to result in jeopardy to the continued existence of the NLEB. Activities proposed by the Fourmile project are not prohibited by the final NLEB 4(d) Rule as these activities will not result in removing a known occupied maternity roost tree or removing any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31 remove trees within 0.25 mile of a hibernaculum at any time.

Potential effects of the action include direct effects to NLEB present within the Fourmile project area when activities are being conducted, and indirect effects as a result of changes in habitat suitability. The types of timber harvest activities that may affect habitat suitability include even-aged management (clearcut, shelterwood/seed tree). Direct effects include mortality, injury, harm, or harassment as a result of removal of roost trees, noise, and general human presence.

No summer maternity roosts are currently known on the ER/FL RD at this time. While not yet discovered, individual summer roosting trees or trees for maternity colonies may be removed during harvest treatments. However, bats will have suitable roosting habitat within or near the same location that can be utilized. While individual roosting trees or trees for maternity colonies may be removed during harvest treatments, bats would have suitable roosting habitat within or near the same location that can be utilized. Since roost switching is common and expected among these bat species, there is a high probability that with implementation of project guidelines for reserved trees, suitable roosting trees would be found. There is also a large quantity of suitable foraging and roosting habitat in and outside the project area on FS and non-FS lands (Table 3 and Table 4).

The project standard and guidelines, which include retaining closed canopy structure in mature forest within 200 feet of seasonal ponds, and leaving all snags possible in harvest areas, will reduce the potential for direct effects to the NLEB. However, the potential for direct effects from timber harvests, road-related activities, and associated human presence is greatest during spring and early summer (mid-April to July) when bats return from hibernation, spring temperatures result in periodic use of torpor, and non-volant (flightless) young may be present. In addition, bats impacted by WNS have additional energetic demands and reduced flight capability.

Indirect effects from the action may result from habitat modification and primarily involve changes to roosting and foraging suitability. Timber harvests and tree clearing associated with road-related activities could have both adverse (such as active season tree removal of a roost tree) and beneficial effects on habitat suitability for the NLEB. Given the scope of the projects in relation to the overall action area, these projects will not substantially alter the overall availability or suitability of NLEB roosting or foraging habitat in the action area.

US Fish and Wildlife Consultation

The US FWS determined that the incidental that is carried out in compliance with the interim 4(d) rule does not require exemption in an Incidental Take Statement. Accordingly, there are no reasonable and prudent measures or terms and conditions that are necessary and appropriate for these actions because all incidental take has already been exempted. The activities that are covered by the interim 4(d) are as follows forest management activities, including various types of timber harvest, road construction and decommissioning, associated noise and general human presence, and site preparation.

The recent listing of the NLEB did not occur as a result of current population declines or viability concerns on the CNNF or in the state of Wisconsin. It was in response to the potential vulnerability to WNS and declining bat population in Midwest and eastern states and Canadian provinces as a result of WNS. The potential for WNS occurring on the CNNF is highly unlikely due to no known hibernacula's. The CNNF and this project area continue to provide essential summer roosting and foraging habitat and recent surveys show a good presence or absence occurrence and representation of bat species. The forest plan would continue to provide and protect those critical bat habitats during the period of year in which they utilize our CNNF the most.

Fassett's Locoweed (*Oxytropis campestris var. chartacea*)

Fassett's Locoweed is an herbaceous perennial that has many leaves clustered in a rosette at the base of the stem. Populations of this species appear to persist indefinitely in a zone above the high-water line along landlocked, hard-water lakes where the Cambrian sandstone bedrock is overlain by sandy glacial drift. Since the water level in these lakes may fluctuate greatly from one year to the next, Fassett's locoweed is present above ground only in this upper zone during times of high water. Nearly all lakes with historical populations of the species are less than 40 acres in size and occur at approximately 1,200 feet elevation. At some sites, such as at Pigeon Lake in Bayfield County, populations may fully disappear for relatively long periods of time, only to reappear after water levels recede. Fassett's locoweed was absent from Pigeon Lake from the late 1920s to the early 1990s, reappearing after prolonged drought in the 1980s lowered water levels for several successive years.

Fassett's locoweed is known globally from the shoreline of eight lakes in central Wisconsin and two lakes in northwestern Wisconsin. On the CNNF, suitable habitat for this species is limited to the shoreline of groundwater seepage lakes on the WRD. These sites are located on the shorelines of Mountain and Pigeon Lakes and both have large populations of Fassett's locoweed with thousands of individuals. Forest Service botanists have conducted multiple surveys in shoreline habitat on the Forest. However, no other locations of this plant have been discovered, but some highly suitable habitat has been found.

In the project area under all alternative the proposed activities are anticipated to have no effect on Fassett's locoweed or its habitat because it is not known to occur in the project area and has no suitable habitat.

Determination (All Alternatives):

No Effect. No Fassett's locoweed or suitable habitat for the plant has been identified in the Fourmile project area or anywhere on ER/FL RD. Adding this impact onto past, present, and reasonably foreseeable actions embodied in the Nicolet National Forest analysis no additional effects would be experienced; thus, no measurable cumulative effects exist and as a result no further analysis is warranted.

Regional Forester Sensitive Species – Animals

Red-shouldered hawk (*Buteo lineatus*)

The red-shouldered hawk is a medium to large woodland hawk that is widespread in eastern United States, southeastern Canada, California, and Mexico. Prior to 1900 it was one of the most common hawks in eastern US, but as with the goshawk, the logging era of the 1900s destroyed prime nesting habitat and the use of pesticides probably contributed to the decline. Presently red-shouldered hawk populations are scattered throughout the north-central states, with a few local areas where they are relatively common (Jacobs, J. and E. A. Jacobs, 2002). In Wisconsin, the red-shouldered hawk is an uncommon summer resident and breeding birds have been reported from many counties across the state. This raptor is less frequent in the southeastern one-third of the state where agriculture dominates. On the National Forest of Minnesota, Wisconsin, and Michigan, possibly more than 95 %, of the red-shouldered hawk's that summer there migrate south in fall. While a very small percentage would winter in the same state, the vast majority of red-shouldered hawks would migrate 300-1,700 km to winter several states farther south (Jacobs, J. and E. A. Jacobs, 2002).

According to Robbins (1991a), the red-shouldered hawk was probably never common in Wisconsin but was most abundant in mature bottomland forests along major rivers such as the St. Croix, Wisconsin, Chippewa, and Wolf. Other mature hardwood forests, particularly those adjacent to lakes and streams, provided suitable habitat for the species but these areas were heavily logged during the lumbering era that ended around 1930. There are accounts of successful nesting of red-shouldered hawks since that time and nest productivity has been monitored on the Nicolet landbase since the 1970s by Tom Erdman (UWGB), John Jacobs (Green Bay), the WDNR and others. John Jacobs has been monitoring red-shouldered hawks on the NNF for over 30 years and attempting to monitor all 88 nest sites on the NNF each breeding season has proven to be extremely challenging. Due to constraints in time, weather, and financial support, it became necessary to divide the workload into two years. Starting in 2008, the 35 nest sites north of the town of

Lakewood would be checked and then in 2009, the ~ 53 sites south of Lakewood. Red-shouldered hawks in northern NNF are fewer and more widespread and possibly have larger nesting ranges. The sites north of Lakewood are spread over a much greater area that is at least four times larger in size than the area south of Lakewood. Nest finding has always been more challenging in this area of the NNF and J. Jacobs acknowledged that this would result in far fewer active nests to monitor each year.

J. Jacobs' monitoring results suggest that the reproduction is low and mortality rates are also low resulting in a stable population with reproduction replacing annual mortality (Table 18; (Jacobs J. , 2017). Another possible factor in maintaining this population is from immigration of red-shouldered hawks from outside the study area. This probability was proposed for sustaining another red-shouldered population with low productivity on the nearby Menominee Indian Reservation (Woodford, J., C. A. Eloranta and A. Rinaldi, 2008). King et. al (2010) conclude that red-shouldered hawk nestlings in Wisconsin exhibit both higher prevalence and relative intensity of infection with *L. toddi* and that this may be a contributory component to the observed lower fledgling survivorship observed in that study.

Table 18. Red-shouldered hawk nesting data for NNF, 2007 – 2017 (Jacobs J. , 2017)

Year	2007	2008*	2009~	2010	2011	2012	2013	2014	2015	2016	2017
Territories Checked	80	35	52	62	65	69	80	72	72	78	81
Active Territories	39	12	25	25	30	32	40	32	32	40	36
Active Nests	22	2	12	17	11	25	20	24	22	22	21
Successful Nests	1	1	3	5	6	7	8	12	11	8	9
# Young	8	-	6	16	10	13	17	24	24	17	18
% Success Nest	18	50	25	29	55	28	40	50	50	36	42

2008* = only northern NNF searched for nests; 2008~ = only southern NNF searched for nests; Na = no data reported

Because 2008 represents only the northern and 2009 the southern NNF, comparing that data to other years should be done with caution. A very late cold spring in 2008 may have contributed to late nesting, or lack of nesting attempts. A lower number of active nests for 2008 doesn't necessarily reflect a drop in the overall nesting population, but more likely, the fact that southern NNF was not searched (Jacobs J. , 2008). The spring of 2011 was also unseasonably cold with snow resulting in phenological events at least 14 days behind average. As a result, most red-shoulder hawks laid eggs about 2 weeks later than normal and some probably did not lay or laid only one or two eggs. Since 2011, there has been consistently a higher than normal number of active territories and nests along with successful nests, number of young and percent successful nests.

Preferred habitat for red-shouldered hawks is mature hardwood forest, especially those found in riparian areas, wet or moist forest and upland forest adjacent to ponds, wetlands or swamps. Nest trees most commonly used are American beech, maple, oak, and birch. These trees are typically taller and larger than other trees in the stand that are typically 17-40 cm diameter at breast height (dbh) and have a canopy closure 70 % or greater. Forested landscapes that have very open canopy and/or fragmentation enables red-tailed hawks and great horned owls to possibly displace or kill red-shouldered hawks. Water is also a critical element because these wet areas are used as foraging sites. Primary food items can vary from area to area or year-to-year but common species are frogs, toads, small mammals, and birds. Home range sizes are dependent on the availability of nesting and foraging habitat. In northeastern Wisconsin, Jacobs and Jacobs (2002) found that the average home range size is between 222.4 and 432.4 acres. These territories and nest trees do have a high percentage of occupancy from one breeding season to the next. Some reuse of nesting territories has occurred in stands that have had select timber harvests take place during non-breeding months (Jacobs, J. and E. A. Jacobs, 2002). Reuse of the same nest as the previous year has been shown to be very high for red-shouldered hawk. Sometimes the same nest would be used two, three, even four consecutive years. A new nest is often constructed within 492 feet of the previous year's nest (Jacobs, J. and E. A. Jacobs, 2002).

Risks to the red-shouldered hawks include:

- Habitat disturbance during the nesting season. The CNNF has established forest guidelines to protect nest sites (USDA Forest Service, 2004a) and these guidelines are consistent with those implemented by WDNR for goshawks nest protection on state lands which is applicable for red-shouldered hawks: (Woodford, 2005)

  - No-cut area; in all forest types, create a no-cut buffer around the active and any alternative nest trees; the area of no-cut depends on stand type, conifer density, topology, and distance to sale boundary. The recommended minimum no-cut radius is 660 feet around all nest trees. This distance provides a no-cut area of 31 acres for a territory with one nest.
  - The no cut buffer is designed to eliminate disturbance within the nest area and reduce the impact of weather on nesting birds. This reserve area also would reduce the likelihood of predation and interspecific competition from red-tailed hawks and great horned owls.

- Loss of mature forest habitat or habitat alterations that promote a fragmented forest canopy. Breeding habitat alterations appear to have been and probably continue to be the greatest threat to red-shouldered hawk populations. However, J. Jacobs states that selective harvesting of hardwoods, if done properly, can be compatible with the red-shouldered hawk. The project would not affect this risk.
- Avian or mammalian predation of both young and adults. J. Jacobs reports that he has not collected detailed information on nest predation; however, the nests where he was able to determine predation it has been due to fisher, raccoons, and great–horned owls. The project would not affect this risk. Poor weather conditions during the nesting season. The project would not affect this risk.
- Gypsy moths. Defoliation of the forest by Gypsy moth larvae could have a severe detrimental effect on red-shouldered hawk nest success. During May and June of 1989, the NNF was severely defoliated by tent caterpillars. During that year only one of 19 active nests was successful. J. Jacobs attributes that low reproduction to predation on young and adults at the nest because of lack of leaf cover. The project would not affect this risk.
- West Nile Disease. Raptor rehabilitators at the Bay Beach Wildlife Sanctuary, Green Bay reported a large number of deaths of young raptors from West Nile virus in northeast Wisconsin in 2005. This could be partly responsible for the lower red-shouldered hawk reproduction for 2005 (Jacobs J. , 2005). The project would not affect this risk.

Measures

Multiple factors are involved in nest site fidelity and nesting success. Red-shouldered hawks may abandon nest sites in areas under total protection, as well as in areas under active management. Nesting successes and failures are known to occur likewise in both managed and unmanaged habitats, and birds have been observed to move among the various habitats, often relocating to suitable habitat within a mile or so of the original nest site.

In the effects analysis for red-shouldered hawks, suitable habitat is defined as northern hardwoods (CDS codes 81-89) and hardwoods with hemlock (type 20), northern red oak (type 55), and lowland hardwoods (types 71, 76 and 79). All of the above types must be uneven aged or 50+ years old to be considered suitable for red-shouldered hawks because that condition or age is approximately when the forest is expected to have a closed canopy and some trees would be large enough to be used for nesting. Water is a critical element of red-shouldered hawk habitat; however, it is not included in the habitat model run for the species. This is due to a FS review of nest locations in proximity to wetland habitat. Generally, this analysis (St. Pierre, M and J. Schmidt, D. Eklund, 2008) found that compared to the model that did not stratify for proximity to wetlands, most, or about 96 % of existing habitat already occurs near a riparian type. Also, woodland ponds, small streams, wetlands, and other ephemeral water resources are abundant throughout the project area and NNF.

Selection harvesting is not expected to have an effect on red-shouldered hawk because the canopy closure before and after the cut would remain at about 80 % or greater. For hardwood stands that are thinned (such as an initial cut to begin uneven-aged management), canopy closure is reduced to around 70 % and is expected to return to 80 % or greater closure in five years or less. Stands managed using even-aged silvicultural methods are assumed to be unsuitable for nesting for a period of approximately 50 years following a treatment.

A red-shouldered hawk protection zone will be defined as a 30 acre area (circle) surrounding the nest site and a secondary buffer zone extending 330 feet beyond the 30 acre zone; these zones surrounding the nest are the same as the protection zones for red-shouldered hawk in the forest plan (p. 2-20 to 2-21).

Surveys

Red-shouldered hawk nesting territories and nest locations were obtained from John Jacobs. There are no historic nesting territories in the project area (active in the past 10 years) and no new nests were found during the 2017 survey season. However, we will survey an additional 940 acres of habitat prior to implementation of any harvest treatments to ensure no nesting birds are utilizing the stand. NHI data had no reports of red-shouldered hawks in the project area.

Surveys were contracted out to Sagebrush Advisors, AZ and completed during April 2017. Conspecific calls were broadcast between 85 and 100 decibels; volume depending on topography, vegetation density, or proximity to detected birds. At each calling station red-shouldered hawks calls were broadcast three times, each at 120 degrees of separation on the broadcaster's axis. Between broadcasts, biologists listened and observed for at least 30 seconds. The non-broadcasting biologist remained at a distance or found a proximate vantage point to increase the likelihood of observing a non-vocal response (i.e. soaring flyover or silent inspection). Where riparian corridors or wetlands occurred adjacent to designated survey stands, biologists broadcast additional calls to maximize the potential of eliciting responses from territorial adults in their preferred habitat. When broadcast at ~85 decibels, calls can be audible to red-shouldered hawks over 0.5-mile when broadcast in un-forested riparian corridors (Moorman, C. E. and B. R. Chapman, 1996). Call stations were positioned such that every ten acres, or less, received broadcast coverage. Call stations, visual detections, and audio detections were mapped using a Trimble GeoExplorer GPS unit.

All surveys were conducted in suitable weather conditions, when winds were less than 12 mph and little to no precipitation was occurring. Follow up surveys were conducted at sites that had a positive response. These surveys were conducted until a nesting territory was located or it was determined that no breeding activity was occurring. A conspecific call was played at predetermined locations to "cover" all potential habitats near the response area. Visual search for nests in theses stands was also conducted while walking to the next survey point. Additional nest surveys would be completed during timber-marking procedures by personnel that attended a "Woodland Raptor Nest Identification Workshop" conducted by a FS biologist. (Kennedy, P.L., and D.W. Stahlecker, 1993).

Boundary and Scale of Effects Analyses

Multiple spatial scales were used to evaluate meaningful effects to red-shouldered hawk. For evaluating direct and indirect effects to the species, the project area was used. Any red-shouldered hawks nesting or foraging within the project area have the potential to be directly (destruction of nest tree) or indirectly (loss of habitat) affected by the proposed activities. Cumulative effects to the species are analyzed at the scale of ER/FL and at the Nicolet landbase (not the entire CNNF). This analysis area is appropriate for three reasons:

1) The cumulative effects area is contiguous and because it is predominantly a forested landscape, it is reasonable to assume that individuals could move freely within this boundary.

2) Red-shouldered hawks are rarely found on the Ottawa NF and it is unlikely that those found in the northernmost portions of the Nicolet landbase use the Ottawa NF (Evans, 2006) . Red-shouldered hawks are rare on the Ottawa and possibly only nest in the Sylvania Wilderness (Jacobs, J. and E. A. Jacobs, 2002).

3) The degree to which red-shouldered hawk populations on the Chequamegon and Nicolet landbases interact is unknown but no bird bands or other information exists that compels an analysis area that is so large as to include both the landbases of the CNNF.

Summaries of the availability of suitable habitat across the entire are presented to provide further context for the effects analyses. The temporal scale of the cumulative effects analysis includes past actions (with emphasis on those that have occurred over the past five years), ongoing actions, and those that are reasonably foreseeable.

Threshold of Effects

In the SVE process for the forest plan (USDA Forest Service, 2004b), no minimum numbers of red-shouldered hawk or its habitat were identified although the quantity of habitat was expected to be relatively stable through implementation of the forest plan (forest plan BE; page J-74). Alternatives 3-9 and the Selected Alternative were judged to result in beneficial effects to red-shouldered hawk (USDA Forest Service, 2004a) as a result of standards and guidelines protecting the species and the increase in northern

hardwoods forest types (USDA Forest Service, 2004a). The cumulative effect analysis for the project would determine if the trend in the quantity of suitable habitat is stable, increasing or decreasing. The relevance of the projected trend in habitat availability is discussed in the context of the forest plan forecast to determine whether past, present and reasonably foreseeable actions would result in a habitat trend different from the forest plan projection.

Determination of Effects to red-shouldered hawk

Alternative 1 - No Action

Direct and Indirect Effects:

There would be no vegetation management under this alternative; therefore, there would be no impacts to red-shouldered hawks or their habitat from timber harvest treatments. The result of not implementing any timber harvesting activities would be the passive maintenance or enhancement of nesting habitat for the species. This would occur from northern hardwood stands continuing to develop large trees (suitable for nest sites) and maintain or increase canopy closure, which are important features of red-shouldered hawk habitat. Road activities, wildlife opening improvement would not be implemented, thus impacts to this species would not occur specific to these actions.

Cumulative Effects:

Absent any direct or indirect effects, there can be no cumulative effects.

Determination:

No impact. No actions affecting red-shouldered hawks, or their habitat would occur under this alternative; therefore, there would be no impacts to this species.

Alternative 2 - Action Alternative

Direct and Indirect Effects

In 2016 and 2017, there were 78 and 81 red-shouldered hawk territories respectively monitored on the NNF (Table 18). However, no territories or any red-shouldered hawk nests were located within the project area. As a result, there would be no direct impacts to nesting birds from both alternatives. If any new territories are located in the future, nest protection measures would be implemented (USDA Forest Service, 2004a). This would include a 30-acre no cut buffer surrounding nest site. Surrounding that buffer would be 330 ft. buffer where only activities that do not lower canopy closure below 80 % and that are considered uneven-aged management would occur. These guidelines would be followed under all action alternatives and are consistent with the WDNR work guidelines for forestry and raptor nest site protection (Woodford, 2008). These measures protect red-shouldered hawk reproduction, which is believed to be the limiting life history stage of the species in Wisconsin.

Habitat effects at the project level are displayed in Table 19. At the time of implementation there would be a loss of 5.49 % of suitable habitat for Alt. 2. This reduction is primarily due to selection cuts occurring in stands with a dbh $\leq$ 10 inches (86%) and as a result the canopy closure will be reduced below 80%. However, in 2028, five years post implementation the canopy closure will return to $\geq$ 80% and the stands will once again become suitable habitat. At this time the total amount of suitable habitat in the project will return to pre-implementation amounts. The remain 14% (126 ac) will be unsuitable habitat for 50 years due to those treatments are clearcuts and shelterwood cuts.

Table 19. Red-shouldered hawk habitat at the scales of the Fourmile project, ER/FL and NNF Landbases. For The 2023 and 2028 projections, the effects of all other projects within the analysis area are included.

Project Area	Alt. 1		Alt. 2	
Current Condition (2018)	15,347		15,347	
Following Implementation (2023)	15,410	0.41%	14,504	-5.49%
Five years after Implementation (2028)	15,431	0.55%	15,320	-0.18%
Eagle River - Florence Ranger District	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	122,549		122,549	
Following Implementation (2023)	121,570	-0.80%	120,584	-1.60%
Five years after Implementation (2028)	121,883	-0.54%	123,245	0.57%
Nicolet National Forest	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	244,396		244,396	
Following Implementation (2023)	238,468	-2.43%	237,562	-2.80%
Five years after Implementation (2028)	244,410	-0.02%	244,220	-0.07%

All tree regeneration and release projects occur in stands that have harvest treatments. The tree release activities would occur in immature stands and therefore would not affect nesting habitat. The tree under planting would provide for potential nesting habitat to develop in the long-term.

Fuels reduction treatments would occur in 101 ac. of suitable habitat, but 84 ac. will already be unsuitable long term because they will have shelterwood harvest treatments. Wildlife opening maintenance projects would have no impact because they are not occurring in suitable red shouldered hawk habitat.

Road management within red-shouldered hawk habitat with the action alternatives would result in the following: 77.9 miles of decommissioned roads, 3.1 miles reconstruction and remain open, 14.4 miles reconstruction than close, 0.30 miles new construction than close and 24.7 miles of roads converted to trail. Road management activities would have no impact because there are no nesting territories. There would be a reduction in the amount of road miles in the red-shouldered hawk's suitable habitat which would then decrease vehicle traffic reducing vehicle and human disturbance in that habitat.

Cumulative Effects:

By 2023 the ER/FL RD would experience a reduction in suitable habitat for red-shouldered hawks (-1.6%) (Table 19). This reduction would occur additionally from the harvest treatments within other project areas like Northwest Howell, Morgan Lake and Phelps. This reduction trend in habitat is also seen at the NNF scale with a similar value of -2.8%. This decrease includes the upland hardwood management on the LK/LA landbase in the following projects; Honey Creek-Padus, McCaslin, and Townsend. In 2023 across the NNF at the time of implementation, there would be a decrease of 6,834 ac. of suitable habitat. However, 5 years later there is an increase of almost 6,658 acres which returns the total suitable habitat acres to near 2018 amounts. This overall reduction includes the largest reductions from timber harvest within the Lakewood SE and Townsend project on the LK/LA RD (5,654 acres).

For context, at the Chequamegon and Nicolet level also shows loss of habitat until 2020 (Figure 6). There is a decrease of about 550 acres of upland hardwood on the GD RD and 4,450 acres from oak management on the Washburn Ranger District (WRD). This oak management is occurring in over mature stands that are in decline and would require an even-aged regeneration harvest treatment in order to maintain this type on the forest. The loss of oak was anticipated during forest plan development since 96 % of the oak component is over 70 years (USDA Forest Service, 2004a). However, these reductions are occurring over a 5 year period of time with an increase occurring in 2024 and 2025 that stabilize through 2027 (Figure 7).

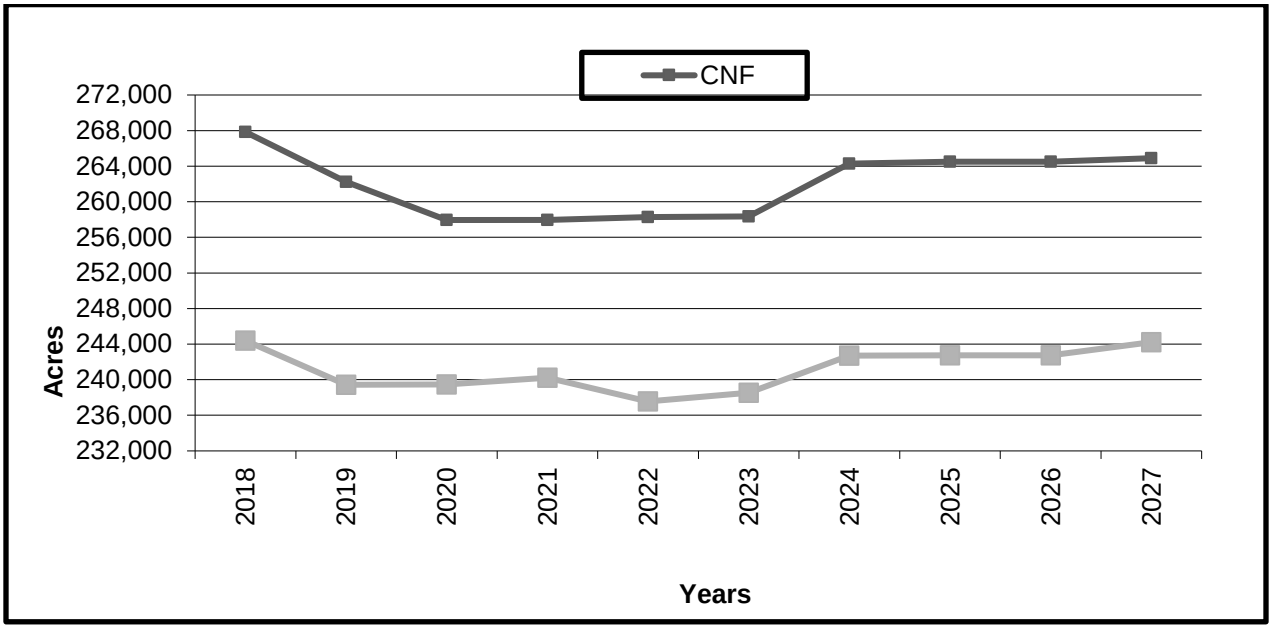


Figure 6. Red-shouldered hawk habitat trends for Chequamegon and Nicolet landbases.

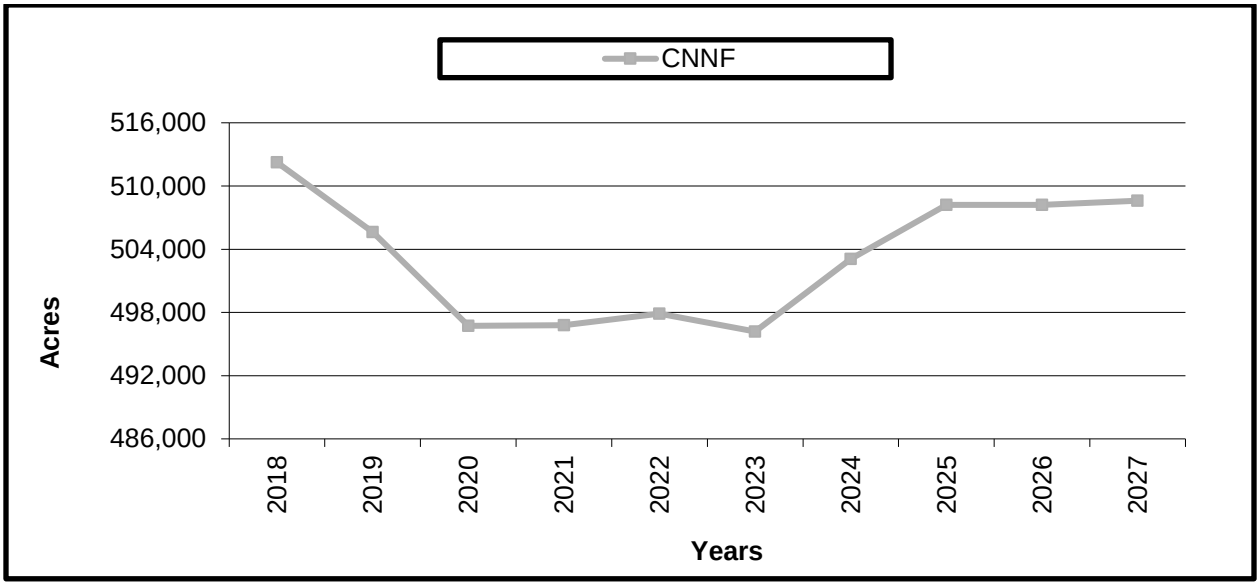


Figure 7. Red-shouldered hawk habitat trends for CNNF landbase.

On non-FS lands inside and adjacent to the project area, there are about 5,335 acres of habitat that may be suitable to red-shouldered hawks (Table 4 and Table 5). Assuming that the age structure of the northern hardwoods forested acres (5,075 ac) is similar to the hardwoods on FS land, most of those acres are suitable now. In the past 10 years there has been 560 acres of timber harvest in suitable habitat on state and private lands enrolled in the MFL program. Single or selection tree harvest treatments occurred in 450 ac. and that would leave these stands with a canopy $\geq$ 80 % and as a result would remain suitable habitat. The remaining 110 ac. we're thinning cuts that would leave the stands unsuitable for five years until the canopy closure once again reached 80%.

Over the next 15 years, timber harvests throughout the same land base would involve 1,156 acres. Most treatments scheduled are to be single tree / selection cuts (1,119 acres) that would maintain those stands as suitable and have no impact. There is 25 ac. that are thinning's and would result in the stand being unsuitable for five years.

For the other suitable habitat on these lands with harvest information we would assume a 15-year re-entry cycle for the northern hardwoods that they are evenly distributed among the years since their last harvest. Approximately 338 acres of that habitat would be selectively harvested in any given year and the treatments would make that habitat unsuitable for a period of five years at most if at all. The result is approximately 93 % of the other ownership land hardwoods (4,737 acres) are assumed available to nesting red-shouldered hawks in any given year.

Determination:

May impact individuals but not likely to cause a trend to federal listing or loss of viability due to reduction of suitable habitat. There are no known nesting red-shouldered hawks within the project or 1-mile buffer area. At the project level, there would be a loss of suitable habitat but most of that would return to suitable habitat within 5 years. Across the District, alternative 2 would result in a decrease at the time of implementation (-2.7 %) and then a return close to the original acers in 5 years (0.57%) (Table 19). With the action alternative, the total amount of available suitable habitat for red-shouldered hawks on the NNF landbase would return close to 2018 amounts (-0.06%) (Table 19).

Design features for the Red-shouldered Hawk

The forest plan standards and guidelines for red-shouldered hawk management would be used to protect the species (USDA Forest Service, 2004a).

Monarch Butterfly (*Danaus plexippus)*

The Monarch butterfly is currently under review by the US Fish and Wildlife Service for potential listing under the Endangered Species Act. North American monarchs form two fairly distinct populations. The western migratory population breeds in the western United States and Canada, and winters near the California coast. The eastern migratory population breeds in the central and eastern United States and in southern Canada, and winters in central Mexico (in the eastern part of the state of Michoacán and western part of the state of México) (North American Monarch Conservation Plan, 2008).

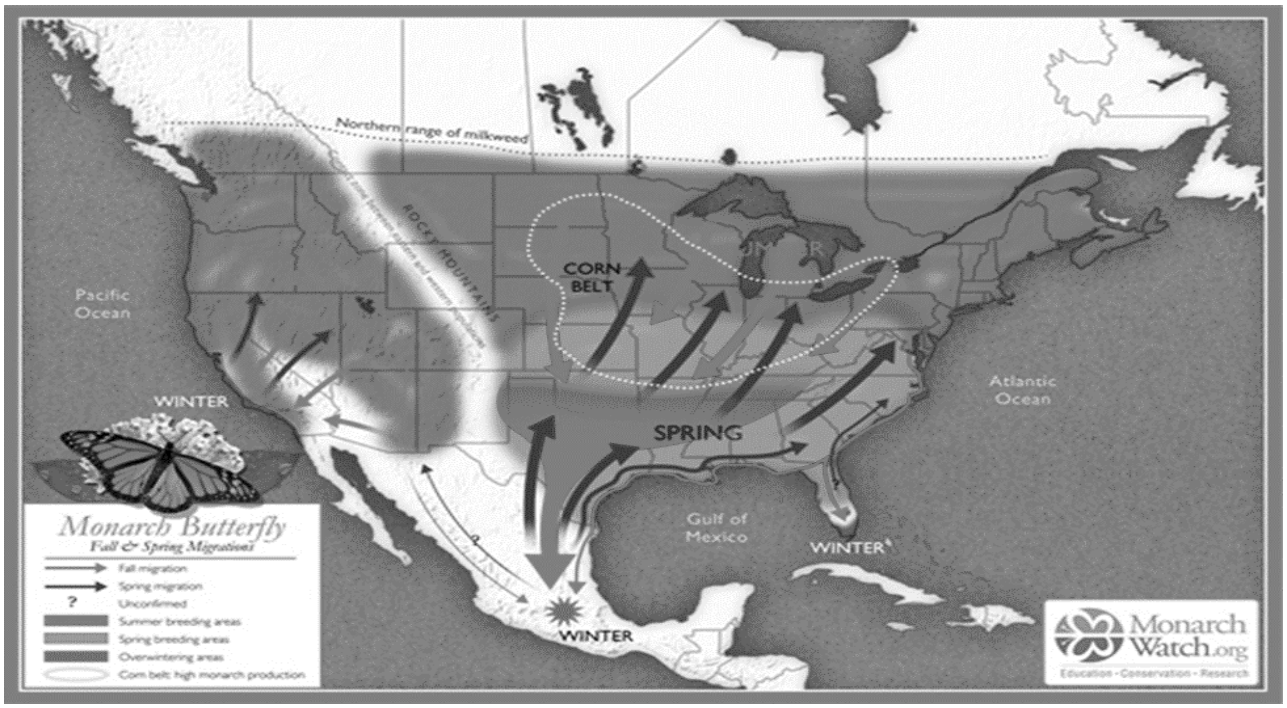


Figure 8 . Monarch migration routes

The adult monarch is a relatively large butterfly, with a wingspan of approximately 9 to 11 cm. Its bright orange wings have black veins, and black edges that contain white spots along the margin. The underside of the wings is duller orange, so that when the wings are folded in rest, the butterflies appear camouflaged as they cluster or rest singly in trees or on other substrates. The species is sexually dimorphic; males are slightly larger than females and have a black spot on each hindwing consisting of androconial scales. Pheromone-producing androconial scales are used, in related species, to attract mates. However, most researchers agree that chemical communication plays a less significant role in monarch butterflies, compared with other species in the same genus. Females lack the androconial patch, have slightly more brown scales in the orange patches of their wings, and more black scales over the wing veins, making the veins appear wider (North American Monarch Conservation Plan, 2008).

Monarch butterflies go through a four stage lifecycle: egg, larva (caterpillar), pupa (chrysalis) and adult. This cycle is completed in about 30 days. To begin the cycle and adult female will lay eggs on milkweed leaves and within 3-5 days the caterpillar hatches. The caterpillar will feed exclusively on the milkweed plant during 10 – 14 days of continued growth. During that period of 10-14 days the caterpillar will molt 5 times. After that 10-14 day period the caterpillar will pupate and spend the next 9-14 days in a Chrysalis (pupa) during which time it is metamorphosing into the adult form. During the summer adults live for 2-6 weeks, however the migrating generation of monarchs will live all winter (approximately 6-9 months) (Jepsen et al, 2015).

Monarch larvae feed exclusively on plant species in the subfamily Asclepiadoideae. In North America there are 27 different native milkweed species (Asclepiadoideae) as well as a few species in closely related genera, which have been recorded as larval food plants for the monarch. (Jepsen et al, 2015).

Because Monarchs are so widespread in their summer habitat use, the easiest way to estimate current populations and to document population trends is through observations at the overwintering sites. Based on individual tagging and recapture rates it is known that the late summer population is considerably larger than the number reaching the overwintering sites. This indicates that most individuals do not survive the migration to the overwintering sites and therefore do not contribute to the next generation in the spring (Brindza et al. 2008, Jepsen et al. 2015).

Using an estimate of 50 million monarchs per hectare (Slayback et al. 2007) the Eastern North American population is estimated to have had an annual average of 463 million individuals from 1994 to 2003. The highest population estimate was for the winter of 1996-1997, with more than one billion individuals. In 2011, 2012 and 2013 annual estimates dropped to 144.5 million, 59.5 million and 33.5 million respectively (Butler 2014). In 2015-16 there was excellent weather and the monitoring indicated that the population was occupying 4.01 hectares, an increase of over three times the previous year's amount. However, during the past two years there was extreme or unusual weather that contributed to decreases in the populations; 2016-17 = -27% and 2017-18 = -3%.

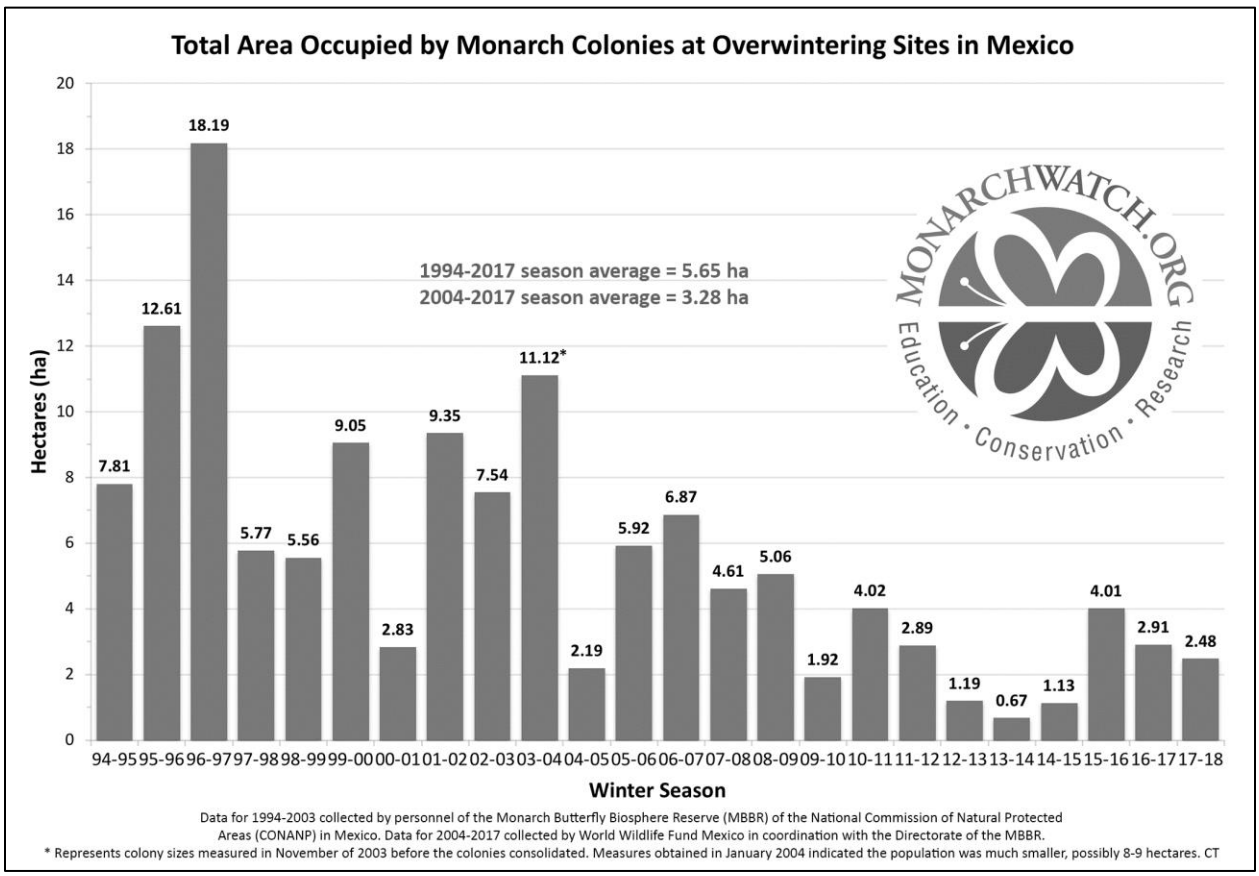


Figure 11: Overwintering Habitat Area occupied by Monarch Colonies.
https://monarchwatch.org/blog/uploads/2018/03/monarch-population-figure-monarchwatch-2018.png
Downloaded: 08-01-2018

The Monarch is found throughout Wisconsin and is one of the most recognized and widely distributed butterflies. Monarchs migrate north into Wisconsin in May and has several generations, with the last generation migrating to Mexico. These large migrating groups are most common along Lake Michigan or the Wisconsin and Mississippi Rivers. They lay their eggs on a variety of Milkweed plants, in both upland and lowlands, and can often be found along woodland edges where milkweeds are prevalent. The Monarch is very fond of nectaring on whatever is abundant and in flower at the time, so the best place to look for them is open areas with abundant nectar sources. There are several butterfly habitat improvement and creation projects that are scattered across the CNNF. None of these are within the project area but there are monarchs associated with numerous small wildlife openings and roadside ditches with milkweed plants providing habitat. None of the proposed Four Mile Project activities will negatively impacted these sites or habitats.

Determination (All Alternatives):

No impact. Monarch butterflies and their suitable habitat are found in the project area. There are scattered wildlife openings and roadside ditches that have milkweed plants but they there will be no negative effect to these habitats from proposed actions. Since there will be no effect, there will be no adding impacts onto past, present, and reasonably foreseeable actions embodied in the NNF landbase analysis. No additional effects would be experienced; thus, no measurable cumulative effects exist and as a result no further analysis is warranted.

Spruce Grouse (*Falcipennis canadensis*)

Spruce grouse are medium-sized, stocky, dark-colored residents of northern coniferous forests containing short-needled conifer-dominated tree species such as white or black spruce, balsam fir, tamarack, and jack pine (Gregg, L., B. Heeringa and D. Eklund, 2004). The extent to which spruce grouse occupied Wisconsin prior to the logging era remains unknown, but observations in the mid-1800s indicate that the species was a common resident of conifer forest of the northern portion of the State. By the 1890s the species was far less common and by the 1940s its range had receded considerably due to extensive logging and homesteading (Gregg, L., B. Heeringa and D. Eklund, 2004). The species range in Wisconsin, according to Scott (1943) includes all of the CNNF except for the Medford Ranger District, which has not been occupied by the species for over 100 years. These forest types provide a major food source for spruce grouse in the form of short-needle conifer needles or from the ericaceous understory vegetation that accompanies these forest types. Additionally, these forest types also provide cover from inclement weather and predators. The birds habitat use across its range in 1980 suggested an east to west scale of habitat preference where wet lowland forest was preferred in the northeast, and changed to more upland habitat as one progressed farther west (Gregg, L., B. Heeringa and D. Eklund, 2004).

On the CNNF, black and white spruce, tamarack and jack pine were reported as important tree species for spruce grouse. It was also found that a greater importance of jack pine and little use of forests with an eastern hemlock or northern white cedar component when compared to previous research (Anich, N., M. Worland and K. Marten, 2013). Birds also used lowland spruce-tamarack swamps in spring and summer and then moved to jack pine in autumn and winter. Worland (2009) found that spruce grouse often occupy the edges of upland and lowland coniferous forest, especially mature (> 90 years) black spruce-tamarack forest adjacent to young (< 30 years) successional stands of upland spruce, jack pine or red pine. The key elements in this short-needle dominated habitat appear to be young or stunted trees (in lowlands) with a high enough stem density to provide birds with a food source and live branches at or near the ground that provide concealment and protection during nesting, foraging, and inclement weather (Gregg, L., B. Heeringa and D. Eklund, 2004), (Boag, D. A. and M. A. Schroeder, 1992). In the project area there is currently 1,408 acres of suitable habitat.

Spruce grouse are dependent upon forests of short needle conifers, and the loss of such habitat has been associated with population declines. Reductions in spruce grouse numbers resulting from Euro-American forest removal have been documented across the Great Lake States of Michigan, Minnesota, and Wisconsin (Gregg, L., B. Heeringa and D. Eklund, 2004). Because spruce grouse appear to desire earlier successional stages of short-needle conifer forests, logging per se does not have a long-term effect of habitat reduction. Rather, changes to the overall forest composition through conversion of short-needled conifer to other forest types or the aging of short-needled conifer forests have the greatest potential to negatively affect the species (Gregg, L., B. Heeringa and D. Eklund, 2004).

Predation is assumed to be a major cause of mortality in spruce grouse. The Conservation Assessment for the species indicates that loss at egg or chick stage seems to be the period of greatest predation on known to prey upon spruce grouse; species like the northern goshawk and barred owl are considered major predators on spruce grouse. Boag and Schroeder (1992) noted that most of the mammalian predation takes eggs and chicks, whereas raptors tend to take adults. Historical spruce grouse declines have been attributed to human settlement and the killing of these unwary birds by humans (Gregg, L., B. Heeringa and D. Eklund, 2004). Accidental kills are known to occur in Michigan and Wisconsin where the species is not legal to harvest; such mortality represents a threat to the maintenance of the small and/or isolated population segments existing there. To offset this potential impact, the CNNF in cooperation with the WDNR, annually posts signs at access points used by ruffed grouse hunters to inform them of the potential presence and nongame status of the spruce grouse.

Although observations of the species had occurred over time on the CNNF, surveys for the species outside the Forest's Breeding Bird Survey (BBS) were not conducted until 1992–93 with assistance of Larry Gregg of the WDNR. These survey's searched 19 sites containing lowland conifer suitable for spruce grouse which located 15 individuals (Gregg L. , 1993). More recently in 2006-2007 and 2010-2011 research was conduct across the ER/FL RD that analyzed habitat, nest site selection, nest survival, productivity and survival of spruce grouse (Anich, N. and K. Marten, 2013) (Anich, N., M. Worland and K. Marten, 2013).

The species is considered to exist at low numbers in pockets of suitable habitat across the Forest. NRM data base has 39 observation records in the project area that are all on FS property. There are 3 sites that have multiple observation (Spring Lake area) and 13 individual observation sites scattered across the project area. Within the 1-mile buffer of project are, there are 9 other reports that are all on FS property: 4 individual observations and 1 cluster that has 5 observations (Kimball Creek and FS Rd # 2182). To analyze effects to spruce grouse, lowland conifer habitat of all ages were considered to be suitable habitat (FSVeg types 12 and 18). Additional upland habitat is in short-needled conifer habitat types including jack pine, upland spruce and balsam fir that are 30 years of age and younger (FSVeg types 01, 08, 16, 17, 23, and, 24) and all age classes of mixed aspen-white spruce-balsam fir (FSVeg types 11, and 95) that are adjacent to large areas (90 acres singularly or in aggregate) of lowland conifer habitat. Approximately 70 percent of the species' habitat on the CNNF remains within the lowland short-needled conifer community.

Surveys

Surveys were conducted in April 2018 within those stands that were identified as suitable habitat that had proposed harvest treatments. There were no observation of spruce grouse during surveys or any nesting records on FS lands within the project area. Surveys began at sunrise and lasted for approximately 4 hours and consisted of a combination of walking a grid pattern while broadcasting records of female cantus call and/or male flutter-jump and tail flicks from a portable handheld speaker (Anich, N. and K. Marten, 2013). Male spruce grouse would be detected when they responded to the recordings with a flutter-flight display and females with a cantus call response (Worland, M., K. J. Martin and L. Gregg, 2009). NHI data has no observation within the project area on non-FS lands.

Boundary and Scale of Effects Analysis

Habitat for the species exists across the CNNF landscape in scattered habitat pockets. Analysis of habitat at the scale of the project area is needed to evaluate the direct and indirect effects of this project. The Forest-level scale supplies the context for effects to habitat across the CNNF. With the spruce decline epidemic affecting suitable spruce grouse habitat across northern Wisconsin since 2004, it is appropriate to examine the potential effects to the species' habitat within the project area and at the scale of the entire CNNF.

Effects of forest management on spruce grouse habitat can be short term and long term. Some treatments do not alter forest conditions enough to change habitat suitability. Additionally, time allows some unsuitable habitat to grow into conditions suitable for spruce grouse. Following the habitat definitions of the Spruce Grouse Conservation Assessment (Gregg, L., B. Heeringa and D. Eklund, 2004), short-needled conifer is considered suitable habitat within 5 years of establishment and lasting until it is 30 years of age (short term), after which it would no longer be considered habitat because it would no longer provide the structural attributes favored by the grouse.

Threshold of Effects

In the SVE process for the 2004 Forest Plan revision, no minimum numbers of spruce grouse or its habitat were identified and all alternatives were judged to result in the same ecological outcome for the Forest (Outcome C) (USDA Forest Service, 2004a) except for Alternatives 1 and 2 which received an Outcome D (but without a rationale provided by the panelists). Panelists based their judgments on the loss of upland habitat (see discussion on Forest Plan revision model above) which ranged from -5.8 to -6.9 percent (in 10 years) and on the retention of short-needled conifers in other forest types and through adjacency considerations. Including the lowland conifer habitat, Alternatives 3-9 ranged from -1.64 to -1.97 percent losses in total habitat. The selected alternative projection for the first decade was for a loss of 9.9 percent of the upland habitat (loss of 2.82 percent in total habitat) for the species which groups it with Alternatives 1 (-16.3 percent) and 2 (-8.8 percent) in terms of upland habitat loss or -4.64 percent and -2.51 percent loss in total habitat, respectively. These alternatives received the D Outcome (population expected to stay at its present level). Thus, losses approaching 16% of the upland habitat or 4.6% of the total habitat over the first decade would be a maximum threshold for effects on spruce grouse habitat.

Across the Chequamegon-Nicolet National Forest, upland spruce grouse habitat is being lost as a consequence of:

- Forest wide emphasis on longer-lived community types (especially northern hardwoods forest types) (Forest Plan ROD pp 7-10), partially at the expense of mixed aspen and spruce types. Past present

and reasonably foreseeable projects implemented on the CNNF include treatments to convert spruce grouse habitat to non-habitat types.

- Special land allocations (Forest Plan ROD pp 7-10) in which upland spruce grouse habitat would be presumed to be lost through natural conversions to longer lived species
- Spruce decline epidemic which has reduced the acres of upland spruce habitat.

Current Forest Plan direction would have no Forest Service management in lowland conifer spruce grouse habitat, and so that habitat would be passively maintained.

Determination of Effects (Environmental Consequences)

National Forest system lands within the project area were evaluated for direct and indirect effects of alternatives to spruce grouse and their habitat and considered effects of timber harvest, opening improvement, road activities, fuels treatments and cultural treatments.

Alternative 1 - *No Action*

Direct, Indirect, and Cumulative Effects

There would be no direct or indirect effects to spruce grouse because no conifer habitat would be treated. However, changes in the amount of suitable spruce grouse habitat would occur. Some forest types provide suitable spruce grouse habitat at any age. Some forest types (such as jack pine and spruce) would become suitable spruce grouse habitat for a period of time and then at some point again become unsuitable, generally after age 30. In addition, spruce grouse habitat is declining Forest-wide as a result of the Spruce Decline epidemic. The loss of spruce grouse habitat from this epidemic is unrelated to the Fourmile project and would be expected to continue no matter what alternative is selected. This will be occurring naturally in the project area as there will be 2-3% loss of habitat due to outgrowth of upland habitat up to 2025 (Table 20). Since there is minimal to no direct or indirect impacts to spruce grouse, cumulative effects will be minimal to none.

Determination.

May Impact. This alternative would result in a small negative change to the amount of spruce grouse habitat available from any type of treatment. However, changes to the amount of habitat available to spruce grouse are occurring as a result of natural growth and decline as well as the Spruce Decline epidemic.

Alternatives 2 – *Action Alternative*

Direct and Indirect Effects:

The project area contains about 6,600 acres of suitable habitat for spruce grouse. This includes 6,262 ac. of suitable habitat that will not have harvest treatments and 398 ac. (6%) of suitable habitat affected by proposed harvest treatments. Harvest treatments will include 217 ac. of clear cuts (29 ac. balsam fir and 188 ac. aspen) that will be unsuitable habitat for the next five years and 84 ac. of overstory removal (balsam fir) and 98 ac. of thinning (93 ac. aspen and 5 ac. balsam fir). These thinning and overstory removal treatments will result in the stands being suitable habitat after harvesting due to that habitat is suitable at all ages. As a result, directly after implementation there will be a 6.17% decrease of habitat in the project area (Table 20). Contributing to this decrease is 194 acers of suitable habitat becoming unsuitable due to outgrowth or growing too old beyond the age class parameters to suitable habitat. Five years after project implementation, there will be an increase in suitable habitat of approximately 3.0% from current conditions but still result in an overall decrease in habitat of 3.0 % from 2018 (Table 20).

The project proposes to harvest suitable habitat that is adjacent to low land conifer stands with no harvest treatments that are also considered habitat for spruce grouse. These stands with proposed harvest were surveyed and there were no spruce grouse recorded. These proposed cuts include 154 ac. of clear cuts, 82 ac. overstory removal and 81 ac. of thinning treatments. The clear-cut stands will likely create an abrupt edge between the two stands due to lack of transition zone between the two habitats. However, with the overstory removal and thinning treatments there will typically be a transition zone (buffer) of timber that will remain along with timber in the harvest stand that can be used by the grouse. There are also red pine stand thinning's proposed adjacent to 8 large low land conifer stands that have documented spruce grouse observations. Spruce grouse researchers have reported that red pine stands along the swamp edge can be

used by spruce grouse for cover during winter and perhaps also for male breeding-display areas. These thinning treatments may have short-term negative impacts on winter use for some individuals, as a reduction of canopy closure could cause birds to move to other nearby stands to overwinter (Peczynski, 2014). However, this impact will be reduced due to untreated red pine and other pine habitat nearby and scattered throughout the project area.

Table 20. Spruce grouse habitat at the scales of the Fourmile project, ER/FL and NNF Landbases. For The 2023 and 2028 projections, the effects of all other projects within the analysis area are included.

Project Area	Alt. 1		Alt. 2	
Current Condition (2018)	6,660		6,660	
Following Implementation (2023)	6,466	-2.91%	6,249	-6.17%
Five years after Implementation (2028)	6,460	-3.00%	6,460	-3.00%
Eagle River - Florence Ranger District	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	31,145		31,145	
Following Implementation (2023)	31,053	-0.30%	30,836	-0.99%
Five years after Implementation (2028)	31,037	-0.35%	31,037	-0.35%
Nicolet National Forest	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	50,114		50,114	
Following Implementation (2023)	49,724	-0.78%	49,507	-1.21%
Five years after Implementation (2028)	49,487	-1.25%	49,487	-1.25%

Road management within spruce grouse habitat with the action alternatives would result in the following: 3.8 miles of decommissioned roads,0.85 miles reconstruction and remain open, 1.3 miles reconstruction than close, 0.0 miles new construction than close and 2.7 miles of roads converted to trail. If birds are near any of this road work, it may temporarily (days to weeks) displace individuals (due to avoidance of people, noise, etc.) but because of the large amount of non-disturbed habitat this will not be an issue.

Prescribed fire and wildlife opening maintenance work will not occur in suitable habitat for spruce grouse and thus there will be no negative affects to this species from those activities.

Cumulative Effects:

At the District level in 2023 and 2028, there will be small reduction in suitable habitat (Table 20). These decreases are small due to an almost equal balance of ingrowth and outgrowth of suitable habitat. For the Nicolet landbase at those times, suitable habitat will also have a small decrease of about 1%. These reduction in 2028 are primarily from harvest treatments associated with the Lakewood SE project on the LK/LA RD.

On non-FS lands inside and within the 1-mile buffer around the project area, there are about 3,700 acres of habitat that is identified as habitat for spruce grouse (Table 4and Table 5). Inside the project area there are large blocks of habitat north of Lone Stone Lake and around Julia Lake. Also, on the south end of the project suitable habitat is located in lowlands near the Eagle River area that are owned by BCPL Trust in and outside the project area. Also in the 1 mile buffer there are stands of spruce/fir in the Little Fork Lake area that could support spruce grouse which would be a good source to those populations on the ER/FL RD. Past land practices on these non-FS lands includes clearcutting fir/spruce (40 acres) and thinning of black spruce (57acres). Future timber management involving suitable habitat include 12 acres of planting fir/spruce, 116 acres clear-cutting, 60 acres of shelterwood cuts, 12 acres of selection cuts, 49 acres thinning and 2 acres overstory removal.

Determination

May impact individuals but is not likely to cause a trend to Federal listing or loss of viability. There are numerous records of spruce grouse in the project area, but no birds were detected in any stand with proposed harvest treatments. However, if occupancy occurs in these stands with harvest treatments there is unaffected suitable habitat available throughout the project area. Suitable habitat increases in the project

area and at the District level directly after implementation and five years after implementation (Table 20). Also, there is almost 3,700 acres of non-FS suitable habitat in and around the project area. On the Nicolet forest, approximately 50,000 acres of habitat is available, and forest-wide is about 95,000 acres. Regionally, this species will likely benefit with improved habitat because new short-needled conifer forest has been replanted in sites where recently diseased-killed jack pine and white spruce was removed. Spruce grouse prefer the younger forest age classes of jack pine rather than the over-mature jack pine.

Wood Turtle (*Glyptemys insculpta*)

The wood turtle is a medium-sized turtle with a low, broad, gray to brown, usually keeled shell with concentric growth layers. The lower shell (bottom) is yellow and each "square" has an irregular dark lateral blotch. An adult usually reaches 5-8 inches (14-20 cm) in shell length. They can be long-lived, as evidenced by a 58-year-old captive specimen. However, it is likely that most Wood turtles in natural populations live for a maximum age of 32 years (Nature Serve, 2016b). Wood turtles have an original North American range that extended from Nova Scotia to eastern Minnesota, south to northeastern Iowa, east to Virginia and north to New York. In Wisconsin, wood turtles were once found throughout the state, except in the southwestern-most portion. Currently it is listed as Threatened, as only small-scattered populations exist in isolated habitat mainly along the Black, Wisconsin, St. Croix, Brule, Oconto, and Baraboo Rivers (WDNR, 2016d). On the CNNF, wood turtles have been observed on all ranger districts except the Washburn Ranger District (RD). On the NNF side, the ER/FL RD has had approximately 20 with most of those observations within or near the Pine River. Other reports have been made on the Wisconsin and Popple River and on smaller systems that include the Woods, Gaspardo, and Simpson Creeks. The LK/LA RD has about 20 observations and all of these have been in the southern half. Most have occurred along the Oconto River and its tributaries where there is also one active communal nesting location on the CNNF.

This species is declining across much of its range, and occurs in small, increasingly disjunct populations (Willoughby et. al. (2013) (Daigle, D. and J. Jutras, 2005). It is more terrestrial than other freshwater turtles, which makes it extremely vulnerable to collection for the pet trade. It has a long-lived life history typical of turtles, so that almost any chronic increase in adult and juvenile mortality leads to a decrease in abundance. Such increased mortality is occurring from increased exposure to road traffic, agricultural machinery and off-road vehicles, collection for pets, and perhaps exotic food/medicines. Increased level of threat is associated with new or increased access to areas by people. Robust data on trend are not available for most occurrences, but available evidence indicates that this species is declining throughout most, if not all of its range. Decline in population size over the past three generations (which likely exceeds 50 years) probably has been substantial (Nature Serve, 2016b). The global rank for this species in 2004 was G4, which is apparently secure. However, the global rank currently is G3, which is vulnerable.

Wood turtles are most commonly associated with forested riparian areas with clear rivers, streams, or creeks with a hard sand or gravel bottom and moderate current are best. Although they are a forest species, they appear to prefer areas in which there are openings in the streamside canopy rather than unbroken forest. The turtle may occasionally be found in non-riparian habitats such as swamps, bogs, wet meadows, upland fields, and farmland. In northern Wisconsin, one study found that juvenile wood turtles vary in habitat preference by month. However, the transition zone between alder thickets and open grassy areas near the river channel consistently has the highest frequency of occurrence of turtles. In eastern Minnesota, wood turtle habitat was suggested as having a generalized slope of 0-2 or 2-6 %, pine, elm-ash-cottonwood, or aspen-birch forest, and hard soil substrate texture such as sand and gravel to rock, sand, sand and gravel, or gravel to sandy loam (Bowen K.D. and J.C. Gillingham, 2004). Other habitat studies have found that river channels, lowland wet areas and alder stands were the most preferred habitats (Arvisais et. al. (2004) (Bowen et. al. (2004). The 20 turtle observations on LK/LA occurred in the following habitat: five in water, five in red pine, three in upland hardwoods, three in black ash/elm/red maple, two mix swamp conifers, and two on private lands. Winter dormancy takes place in water with some hibernacula reported in muskrat burrows, under overhanging tree roots along banks, beaver ponds, and the bottom of streams. Wood turtles are opportunistic omnivores and have a strong preference for vegetable matter, including fruits, berries, tender leaves, and mushrooms. They will however consume insects, mussels, carrion, with invertebrates and plant matter predominant (WDNR, 2016d) (Nature Serve, 2016b).

Wood turtle's home ranges are generally centered on a creek, stream or river and may be elongate in shape as a result. Due to this close association with a water system, virtually all turtle locations are within 150-300 m of streams used by the turtles (Bowen K.D. and J.C. Gillingham, 2004), (Arvisais et. al. (2002), (Cochran et. al. (2014), (Lewis, T., T. Arnold and A. Schneider, 2015), and (Curtis J. and P. Vila, 2015). (Brown et. al. (2016) found that the maximum distance from flowing water was 401 m and 245 m for males and females, respectively; however, 90% of male and female observations were within 70 m and 100 m of flowing water, respectively, and 95% of observations were within 160 and 120 m, respectively. In general, the ecotone between alder thickets and open grassy areas near the river channel consistently has the highest frequency of occurrence of turtles (Brown et. al. (2016). In addition, more recent, literature from research in Minnesota (Brown et. al. (2016) indicates that individual turtles would typically remain near flowing water, even in the summer months when they expected primarily terrestrial habitat use. They found that males and females generally stayed within 70 m and 100 m of flowing water (i.e., 90% of observations), respectively. The apparent strong effect of flowing water on space use was consistent with unpublished data from Wisconsin (WDNR, 2016d) as well as all studies conducted on northern, eastern, and southern (i.e., Iowa) wood turtle populations. Sweeten (2008) reported that in Virginia, 93% of wood turtle observations in the summer were within 90 m of flowing water. In New Hampshire, 95% of male and female locations were within 61 m and 188 m of flowing water, respectively (Bol, Leslie, 2007).

Arvisais et.al. (2002) found that 90% of observations were within 150 m of flowing water in Québec. Williams (2013) reported the maximum observed distance from water was 155 m and mean distances were within 50 m for all activity periods in Iowa. Thus, wood turtles have been observed to travel anywhere from 60-300 meters from the water's edge during the summer months. Reproductive activity (eg. courtship, copulation) is aquatic and they lay clutches of 4 to 18 eggs (avg. 8) in late May or June. This species is a communal nester and females from several miles upstream may congregate in a discrete, traditional site each year to nest. Nesting occurs once a year, usually in sandy, exposed, elevated soil with a southerly aspect near the river or stream. Arvisais et. al. (2002)ported in Quebec, that during nesting season the turtles related to stand type (mixed), tree and upper shrub cover (young, short, low tree cover, moderate upper shrub layer, and low canopy closure), as well as nearness to an aquatic habitat. Compton et. al. (2002) also showed that within their activity area, turtles tended to select non-forested areas that were close to water and had low canopy cover.

Measures

Potential threats include damming, stream bank stabilization, and intensive timber harvesting activities within 300 m of inhabited wetlands. Stream bank stabilization may impact populations if affected areas are used for nesting. While wood turtles appear to prefer woodlands with mixtures of closed and open canopy and forest edges, complete removal of forest and underbrush on a broad scale is likely to be harmful. Other threats are predation of nests by raccoons, skunks, crows, ravens, and coyotes. Hatchlings and juveniles have many potential predators including raccoons, skunks, opossums, birds, other turtles, and fish. Adults may also fall victim to predatory attacks from mostly raccoons, however, any opportunistic predator might attack an adult wood turtle. Also, the removal of turtles of any age by humans for exploitation in the commercial pet trade will have negative effects on the population.

The forest plan and FEIS include management guidelines in the following section; forest plan (pp. 2-22 to 2-23), RFSS Standard and Guidelines, Wood turtle Guidelines;

- Protect known communal wood turtle nesting sites from predator impacts, where feasible, and protect from site disturbance due to construction, or recreation use impacts.
- Stream bank stabilization projects must protect wood turtle nesting sites. Utilize the following mitigation measures: (1) Reshape the bank and smooth contours when revegetating exposed stream banks; (2) Partially cover stabilization structures with sod and revegetate with species similar to those growing on the adjacent bank; (3) Vary the rock size and utilize native rock for rip rap and within-water rock structures; and (4) Maintain natural lake edges and stream meanders when making shoreline and within stream improvements.

Surveys and habitat evaluation

Surveys were not conducted due to the species elusive behavior which make them very difficult to detect. Wood turtles have in the past buried themselves in mud, use thick vegetation cover along riverbanks, and utilized deep water which all inhibit detections.

In 2016 the CNNF stream segment classification system was used as one basis for identifying suitable overwintering streams for wood turtles. The system is based on three delineative criteria including bankfull width (<20', 20-50', >50'), water temperature (cold, cool, warm) and alkalinity (acid, <5 mg/l; soft, 5-20 mg/l; alkaline, >20 mg/l) (Higgins, 2016). These streams were further analyzed by Robert (Bob) Hay, Reptile / Amphibian Conservation Specialist and retired WDNR State Herpetologist who has extensive expertise and research experience specific to wood turtle habitat and population dynamics on the CNNF. Bob Hay filtered this original list down to the following overwintering rivers and tributaries within the project area where we could expected to find wood turtles based on his species-specific knowledge : Eagle River, Four Mile Creek, Furbush Creek, Haymeadow Creek, Kimball Creek, Nine Mile Creek, and Scott Creek. (Figure 9). It is assumed that if a stream has this suitable in stream habitat, that the adjacent uplands could be occupied by wood turtles. We also used observations from the Natural Heritage Inventory database for this analysis as well as anecdotal evidence.

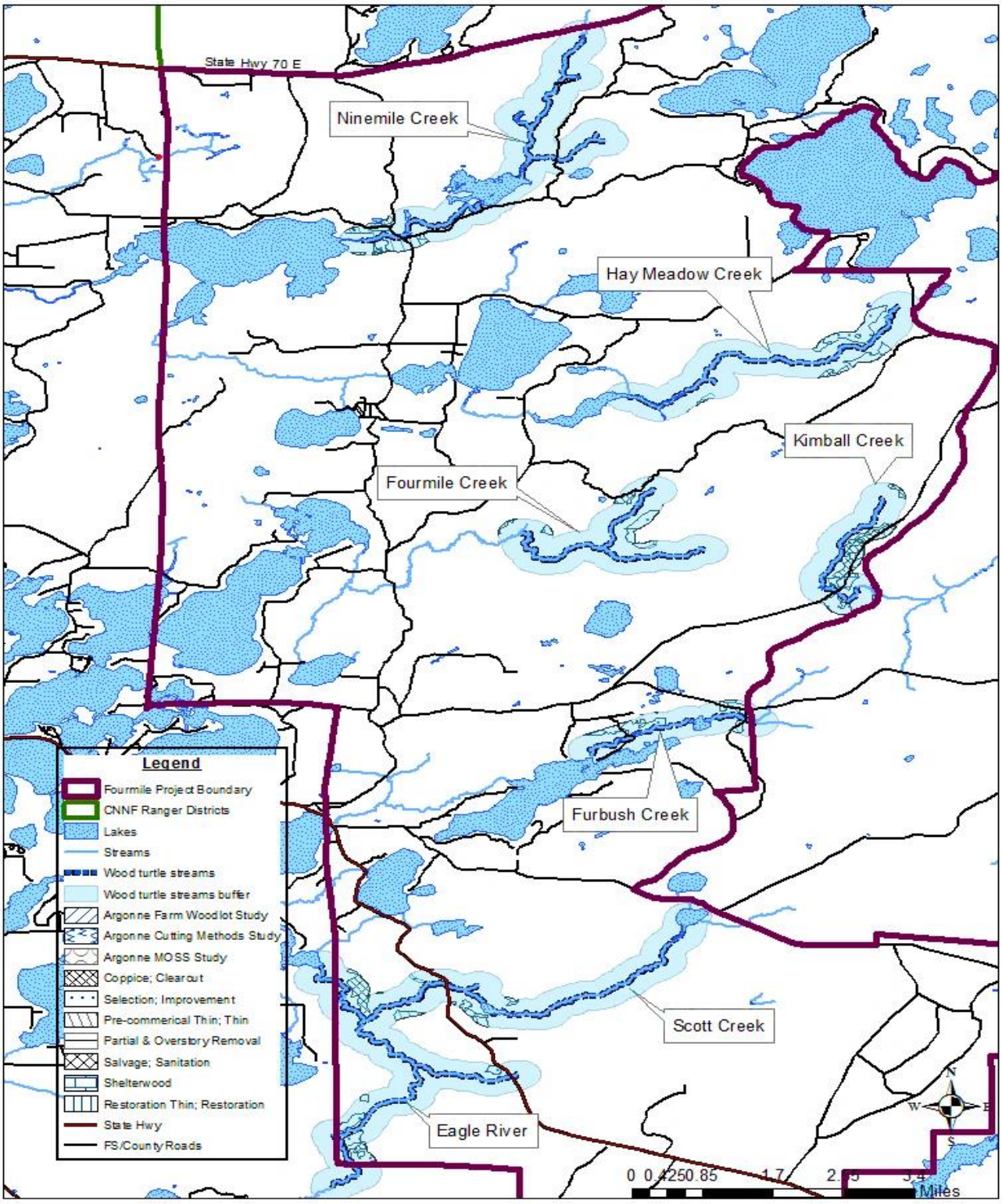


Figure 9. Unsuitable and suitable wood turtle streams with buffers that include proposed harvest treatments in the Fourmile project area.

Boundary and Scale of Effect Analysis

Two spatial scales were used to evaluate effects on wood turtles. For evaluating direct and indirect effects, the project area was used. Any turtles foraging in upland habitat within 300 m from an occupied river have the potential to be affected directly (through disturbance or direct contact of harvesting equipment) or indirectly (by loss or modification of habitat). To analyze cumulative effects to the wood turtles, the ER/FL landbase was used. Although the species is known to occur in both the Chequamegon and Nicolet landbases, most of the records are from the LK/LA RD (forest plan, p. J-98). Because of the turtle's limited mobility, non-connectivity of river systems occupied by wood turtles, localized nature as well as the small number of occurrences on the Chequamegon and ER/FL landbases, it is unlikely that any interactions occur between populations of the species between these landbases.

Threshold of effects

No threshold of effects has been established for this species. However, the BE for the (USDA Forest Service, 2004a) Appendix J p. 98 to 100) identifies key factors that were determined to be important to the assessment of viability of wood turtles. These key factors were derived from the species viability evaluation (SVE) process for the forest plan revision. Key factors include steep, eroding, sandy, or gravely slopes along riverbanks for nesting and down logs and other woody debris. The Forest Plan (2004a) reports that the amount and quality of wood turtle habitat were expected to remain stable or increase under all the forest plans alternatives. Standards and Guidelines that provide greater protection to known and potential nesting sites, and riparian areas would apply under Alternatives 2-9 and the Selected Alternative. This would improve habitat quality under these alternatives beyond what would be expected under Alternative 1 (USDA Forest Service, 2004b).

Determination of effects to wood turtles

Potential negative effect to wood turtles could occur in stands proposed for harvest that occur near (300 m) known turtle observation points and/or are adjacent to water systems that include turtles during the terrestrial period for the species May to Sept. This would occur from the use of harvest equipment within these stands that could make contact with turtles causing death or injury. However, the following mitigation measures would restrict harvest treatments between April 1st and October 1st within 300m of the identified streams. This will minimize/avoid direct impact to wood turtles that may be utilizing upland habitat for foraging and moving to suitable nesting habitat for reproduction during the spring/summer/fall seasons. This recommendation follows the Forest Plan (2004a) (FSM2670.32- Sensitive Species) policy which states "avoid or minimize impact to species whose viability has been identified as a concern".

Alternative 1 - *No Action*

Direct and Indirect Effects:

Under this alternative, no vegetation management or road construction would occur and there would be no effect on wood turtles and their habitat would remain in its current condition for several years.

Cumulative Effects:

Without any direct or indirect effects on wood turtles, there can be no cumulative effects.

Determination:

No Impact.

Alternative 2 - *Action Alternative*

Direct and Indirect Effects:

Within 300 meters of river systems identified as wood turtle habitat, there is a total of 61 stands (566 acres) with timber harvest being proposed. All these stands in that area would have mitigation measure that would only allow harvest activities between October 1 and April 1. This is the time of year when wood turtles would not be using upland habitat but in the streams hibernating. It would also eliminate any chance of killing or injuring turtles with the harvest equipment. This will greatly reduce or eliminate the chances of killing or injuring turtles with the harvest equipment.

While wood turtles are generalists with respect to terrestrial habitat selection (Quinn, N.S. and D.P. Tate, 1991), it appears that they prefer open canopy habitats to closed canopy habitats (Compton et. al. (2002) Dubois et. al. (2009) Tingley (2010) within a primarily forested landscape. Thus, indirect impacts to the wood turtle from the proposed activities are not expected to alter suitable wood turtle habitat to the extent where it would become unsuitable. Selection, thinning, and shelterwood harvest treatments (455 ac.) would maintain a mix of closed and open canopy and forest edges that wood turtle prefer (Bowen K.D. and J.C. Gillingham, 2004). Clearcut treatments in the 300-meter buffer would total 111 acres and would occur in aspen dominated, balsam fir, red and jack pine and stands. These stands are scattered across the project area and at low percentage of the 300 meter buffered area and thus would not cause a threat from being at a broad scale (Bowen K.D. and J.C. Gillingham, 2004).

Road management within the 300 meter buffer area would have the same results with all action alternatives in the following areas: Road management within red-shouldered hawk habitat with the action alternatives would result in the following: 9.7 miles of decommissioned roads, 0.48 miles reconstruction and remain open, 1.5 miles reconstruction than close, 0.17 miles new construction than close and 6.9 miles of roads converted to trail. Decommissioning roads would have positive effects because they would be reducing the amount of road miles in the area. This would then decrease vehicle traffic that would reduce the chance of vehicles hitting turtles on these roads.

Prescribed fire and wildlife opening maintenance work will not occur in suitable habitat for wood turtles and thus there will be no negative affects to this species from those activities.

Cumulative Effects:

Because much of the impact to turtles will be mitigated and past, present, and reasonably foreseeable activities are limited in the local in nature effects analysis area of turtles, minimal to no cumulative effects would be present.

Determination:

No Impact. There would be no effects from the management activities within the 300-meter buffer around rivers with known wood turtle activities due to mitigation measures to avoid effects to wood turtles. Because there are no negative direct and indirect effects, no cumulative effects exist to be analyzed and as a result no further analysis is warranted. (WDNR, 2020)

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are a large, long-lived bird of prey with a historic range from Alaska and Canada to northern Mexico. They are associated almost exclusively with lakes, rivers, or seacoasts were they can find fish, their primary food source. Many bald eagles from interior Canada and northern United States migrate south for winter, although some birds may stay on or near the breeding grounds throughout the year, depending on prey availability and weather conditions. Habitat requirements for the bald eagle include large productive lake and river systems with relatively low human disturbance, and an adequate number of super-canopy nest trees, with long lived white pine favored (WDNR, 1986).

On the CNNF, eagles are generally found on lakes, flowages and along large river systems. Most nests are directly adjacent to water, in white pine or other large trees, with occasional use of artificial nest structures placed for osprey (*Pandion haliaetus)*. Some nests, however, are located well inland from any water body. Because of the overriding importance of nest tree structure and food availability, it is difficult to list habitat association in terms of Forest Service cover types. Eagles begin preparing a large nest comprised of sticks and other vegetation in late February through March. Eggs are laid in late March to early April, hatching approximately 40 days after onset of incubation. Both parents will feed and tend the chicks until fledging at 3 months of age (WDNR, 1986).

Bald eagles have few natural enemies; predation generally occurs during egg incubation or chick development by great horned owls, ravens, and raccoons. Although they are primarily fish eaters, eagles will also harvest other terrestrial and aquatic wildlife and readily consume carrion if available (WDNR, 1986).

***Population Status and Trends*:** In 1782, when the bald eagle was listed as our national symbol the country may had as many as 100,000 nesting pairs. The first decline in the population occurred in the mid to late 1800s due to hunting and loss of habitat. In the 1950s the declined continued due to the use of DDT that interfered with the ability of the birds to produce strong eggshells which negatively affected production (USDI Fish and Wildlife Service, 2016d). By 1963, only about 417 nesting pairs were remaining, and the species was in danger of extinction. In 1967, the Secretary of Interior listed bald eagles south of the 40th parallel under the Endangered Species Preservation Act of 1966. Following enactment of the Endangered Species Act of 1973, the Service listed the species in 1978 as endangered throughout the lower 48 states, except in Michigan, Minnesota, Oregon, Washington, and Wisconsin where it was designated as threatened (USDI Fish and Wildlife Service, 2016d). Since Federal listing in 1973, the USFWS (USDI Fish and Wildlife Service, 1983) and the WDNR (1986) have implemented recovery plans for which the CNNF has been an active participant. After the bald eagle made a strong recovery from the lows of the 1960's and 70's, the USFWS reclassified the bird from endangered to threatened in 1995. In 1999, the USFWS initiated the process to delist the bald eagle as a threatened species and concluded the delisting process in 2007. Bald eagles continued to be monitored for 5 years post-delisting and are now considered a RFSS by the CNNF. A review of the 2004 CNNF Land and Resource Management Plan by the USFWS concluded implementation of the revised plan would have "No Effect" to Bald eagles.

In 1991, there was an estimated 414 active territories in the State which surpassed the recovery plan goal of 360 set by the USFWS. This goal has been achieved annually in the state since 1991 (Figure 10). The WDNR set a productivity goal of 1.2 young per occupied nest; and that goal has also been regularly exceeded. The 2017 WDNR bald eagle surveys found 1,590 occupied nests which is the highest number ever recorded. Bald eagles occupied nests in 69 of the state's 72 counties (96%) with Vilas and Oneida counties having the highest numbers of 168 and 141 nest respectively (WDNR, 2017).

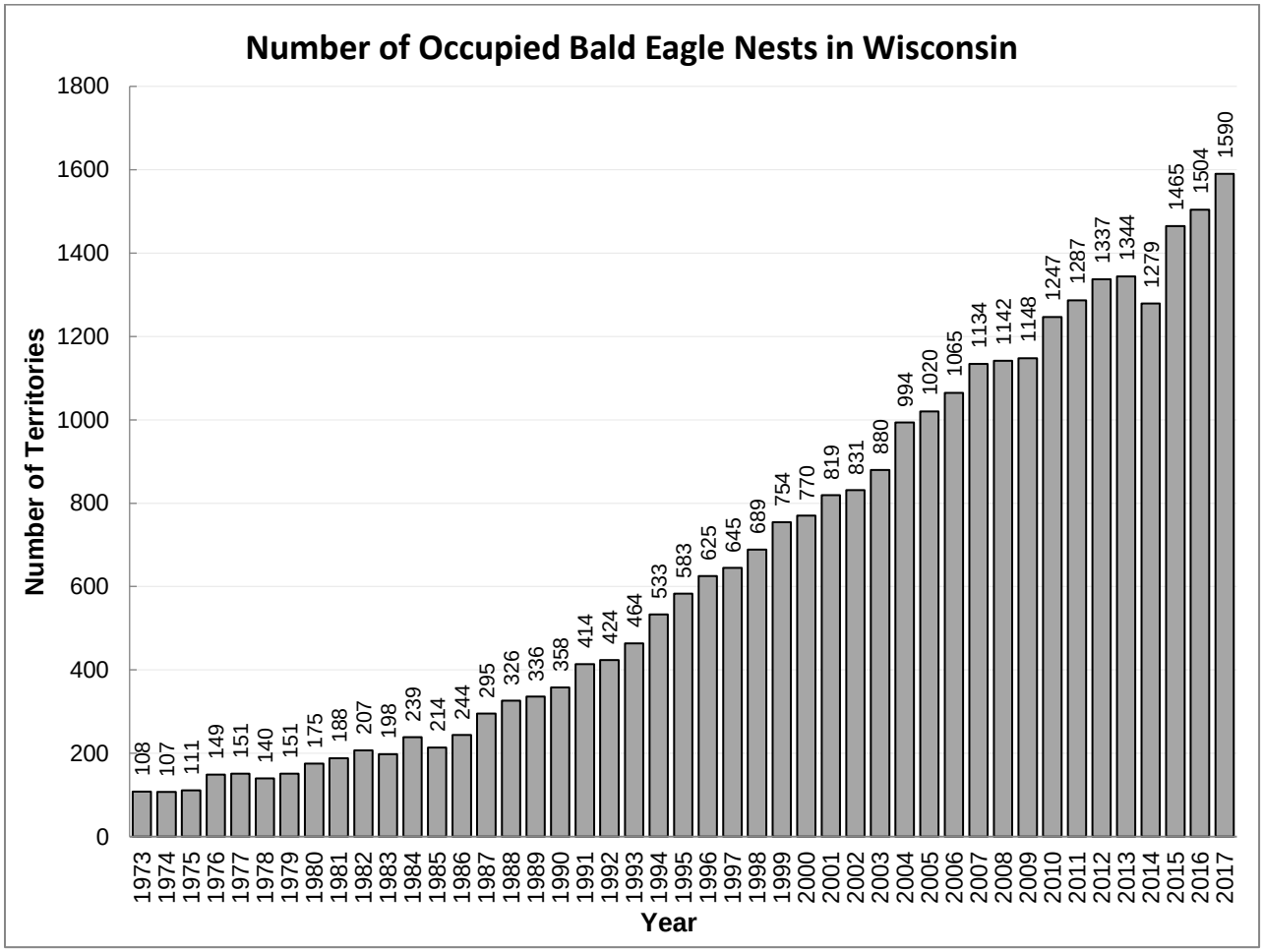


Figure 10. Occupied bald eagle nests in Wisconsin, 1973-2017 **(WDNR, 2017)**.

The 1986 Forest Plans also contained goals of 30 active nests by the year 2000. Bald eagle nests on the Chequamegon landbase totaled 50 nests with 17 active in 2015. The Nicolet landbase in 2015 contained 65 nests with 41 on the ER/FL RD and 21 of them were occupied. Both Forest landbases have met or exceeded the recommended recovery goal.

The Forest cooperates with the WDNR and the USFWS to monitor nest activity annually or semi-annually for occupancy and productivity. The Forest implements the recovery criteria found in the USFWS recovery plan as “Land and Resource Management Plan” Standards to protect:

- Active and Historic Territories from human induced loss or disturbance via implementation of buffers and activity closures and relocation of trails and roads when feasible
- Potential nesting, perching and roost trees during vegetation management activities
- Manage fisheries on the Forest to ensure adequate fish prey sources

***Limiting Factors*:** Human disturbance (although difficult to assess) has been suggested as a cause of reproductive failure in some breeding areas, and adversely affects the suitability of some wintering areas (USDI Fish and Wildlife Service, 1983). Each pair of eagles exhibits different tolerances to direct human disturbance during critical periods such as nesting or winter roosting. Automobiles and planes do not disturb eagles as much as boats, and other human disturbances (WDNR, 1986). Sudden increases in the amount of human disturbance around a nest such as increased public viewing or intensified localized land use can cause unacceptable disturbances during critical portions of the nesting period (Eckstein, R., S. Matteson and P. Manthey, 1997). Within zones 330’ and 660’ from a nest, the Forest Plan guidelines follow Federal recovery plan limits on the scope and timing of acceptable activities to prevent a significant alteration of the

habitat (i.e. clear cutting, major construction action, etc.) or disturbance during a critical life period (i.e. disturb incubation or protection/care of young) (USDI Fish and Wildlife Service, 1983).

Shooting and accidental capture in leg-hold traps account for nearly 40 percent of the injuries to bald eagles admitted to the Raptor Center at the University of Minnesota, and nearly 35 percent of eagles tested had elevated blood lead levels (Natural Resources Research Institute, 2016). Another concern is loss of nesting and perching trees, either through intentional removal or by natural disturbance. In some areas, forest conditions and herbivory are preventing adequate regeneration of species such as white pine. Fisheries management that substantially changes the fish species composition or population (such as rough fish removal) can also be a concern.

Monitoring and Surveys

Aerial surveys on the CNNF are conducted annually in cooperation with the WDNR. These surveys determine nest condition, status of use, and productivity of nests across the Forest. These surveys have been ongoing since the early 1980s and provide productivity and trend information for the species across the Forest. However due to state and federal budget cuts recently there have been only 1 flight per year.

Survey data from 2017 reports 7 nesting territories (10 nests) within the project area. There is 1 adjacent to Franklin Lake and 1 close to Butternut Lake, 2 associated with Upper Nine Mile “Lake” area, 3 near Lower Nine Mile Lake, 1 adjacent to Sevenmile Lake, Fourmile Lake and Hiles Mile Pond. In the 1-mile buffer there are 2 nest; 1 near Hiles Mill Pond and Kentuck Lake.

Table 21. Bald eagle nests in project area and 1-mile buffer with nesting success data.

County	Nest ID	Location	Tree Type	2015	2016	2017	Last Year Occupied
Forest	FO-05b	Butternut Lake	White Pine	.	.	oc	2017
Forest	FO-24e	Franklin Lake	White Pine	0	e	e	2015
Forest	FO-25d	Hiles Millpond	White Pine	.	.	e	2014
Oneida	*ON-024a*	*Lower Ninemile Lake*	*White Pine*	*e*	*e*	*e*	*2009*
Oneida	*ON-024b*	*Lower Ninemile Lake*	*White Pine*	*0*	*e*	*e*	*2015*
Oneida	*ON-024c*	*Lower Ninemile Lake*	*White Pine*	*.*	*oc*	*oc*	*2017*
Oneida	*ON-026e*	*Fourmile Lake*	*White Pine*	*p*	*p*	*p*	*2006*
Oneida	*ON-101*	*Sevenmile Lake*	*White Pine*	*e*	*e*	*e*	*2014*
Vilas	VI-141	Upper Ninemile "Lake"	Osprey platform	e	e	e	0
Vilas	VI-141a	Upper Ninemile "Lake"	White Pine	e	e	e	2012
Forest	*FO-35e	Kentuck	White Pine	0	oc	oc	2017
Forest	*FO-25c	Hiles Millpond	White Pine	0	oc	oc	2015

“*” located in 1-mile buffer around project area; “_” = not surveyed; “e” = empty; “oc” = occupied; “p” = nest in poor condition,

Forest Plan Management Direction - USDA, 2004a, p. 2-18.

Nest protection buffer zones are incorporated from the "Northern States Bald Eagle Recovery Plan" (USDI Fish and Wildlife Service, 1983). These involve restrictions on timing and extent of management activities within 330, 660, and 1,320 feet from a nest. In addition, the Forest Plan lists the following standards and guidelines:

Standard: Retain restrictions as described in the "Northern States Bald Eagle Recovery Plan" (1983) within 330 feet of the former nest tree site (when a nest disappears, but the tree remains, or other suitable nesting structures are nearby), as long as the bald eagle breeding area is occupied. If the nest tree blows down, and no suitable replacement trees are nearby, all restrictions can be removed.

Standard: Remove restrictions in the area beyond 330 feet when a nest is classified as a remnant (i.e., a nest is unmaintained and unoccupied for five consecutive years).

Guideline: Close or relocate roads and trails (under Forest Service jurisdiction) within 1,320 feet of a nest site to vehicular traffic between February 15 and August 1. Waive this requirement only if no feasible alternatives exist and use can be justified.

Guideline: Reserve known roosting, perching, and potential nest trees within active bald eagle breeding areas.

Boundary and Scale of Effects Analysis

Direct and indirect effects to bald eagles were analyzed at the scale of the analysis area, specifically the portion that includes productive lakes suitable as eagle habitat. If there were direct and/or indirect effects, cumulative effects would be analyzed at the scale of the entire CNNF. Such a cumulative effects analysis area is appropriate because Wisconsin's Bald Eagle Recovery Plan (WDNR, 1986) sets statewide population goals and the actions across the entire CNNF could affect eagle numbers in the State.

Threshold of Effects

Alternative 1 - *No action*

Determination of Direct and Indirect Effects

Under this alternative, none of the proposed activities would be implemented to accomplish proposed project goals. Habitat for the eagle would remain in its current condition and change would be driven by natural processes (i.e. natural succession, weather events, etc.) rather than through active management. Thus there would be no direct or indirect effects on bald eagles.

Cumulative Effects

There would be no direct or indirect effects, there can be no cumulative effects.

Determination

No impact.

Alternative 2 - *Action Alternative*

Determination of Direct and Indirect Effects

Alternative 2 proposed harvest treatments occur within the 1,320 ft. buffer around 3 nesting territories:

Nest ON-24 has 3 stands effected: 2177/017, 26.9 ac. (25. 6 ac. impacted) sugar maple forest type with a selection harvest, 2177/020, 37.3 ac. (22.4 ac. impacted) sugar maple forest type with a selection harvest and 2177/040, 39.9 ac. (3.7 ac. impacted), mix upland hardwood forest type with a proposed selection cut. There are 3 nests in this territory and the stands included in ON-24c "no cut buffer" are the same for the other nest and as a result no other stands are impacted for this area. Roads with in the 330 ft. buffer are road number 614373, 709477 and 614372 (ON-24b nest only).

Nest ON-26e has 1 stand effected and that is 2181/026, 5.8 ac. (5.8 ac. effected), balsam fir-aspen-paper birch forest type with a clear cut harvest treatment, there is also roller chopping, disc trenching and planting treatments proposed. No roads effected with in the 330 ft. buffer at this nest location.

Nest ON101 also has 1 stand that is 2178/045, 2.6 ac. (2.6 ac. effected), paper birch forest stand with a thinning harvest proposed along with under planting. No roads effected with in the 330 ft. buffer at this nest location.

Roads in the 1,330 ft. buffer will have 0.6 miles decommissioned and also 0.5 miles reconstructed for timber sale access and then closed. Forest Service Standard and Guidelines allow these types of activity to occur in this buffer with no negative effects to nesting birds. As a result, there will be no negative effects to birds utilizing this nest site. In addition, there would be no indirect effects on eagles or eagle habitat due to loss of nesting and/or perch trees and also be no changes to a foraging area or to the forage base.

Prescribed fire and wildlife opening maintenance work will not occur near eagle's nest and thus there will be no negative affects to this species from those activities.

Cumulative Effects

There will be no direct or indirect impacts so adding them onto past, present, and reasonably foreseeable actions' impacts would result in minimal to no cumulative effects.

Determination

No impact. Because no negative effects are anticipated under the alternatives analyzed, there would be no direct or indirect effects to bald eagles in the project area. Because there are no direct and indirect effects, no cumulative effects exist to be analyzed and as a result no further analysis is warranted.

American Marten (*Martes americana*)

The American marten is a small, rare weasel-like species that live in mature, dense conifer, deciduous, and mixed conifer-hardwood forest. This diversity of forest communities used strongly suggests that tree species composition is not as important as overhead cover and residual patch size (WDNR, 2011). Also critical to marten use is the presence of large snags, fallen trees, stumps and root mounds known as coarse woody material (CWM) (WDNR, 2016e). Wright (1999) found on the NMPA that both sexes selected mixed hardwood-coniferous but avoided aspen/aspen-spruce/fir, swamp conifer, and non-forested types.

These mature forests that covered northern Wisconsin before the 1800s provided prime habitat for American martens. However, with the arrival of European settlers, trappers, and lumbermen who settled the land, cut forests and trapped without restrictions, the species declined. As a result, trapping was banned in 1921, but by 1925 martens had been extirpated from the state (WDNR, 2011). Efforts at reestablishing an American marten population in Wisconsin began in 1953, when the Wisconsin Conservation Department imported five animals from Montana and released them on Stockton Island in Ashland County and none survived. Marten were again reintroduced by the WDNR between 1975 and 1983 on the Nicole Marten Protection Area (NMPA) and from 1987 to 2010 on the Chequamegon MPA (WDNR, 2011). Currently these marten populations exist and remain concentrated in the reintroduction areas on National Forest lands (Woodford et. al. (2005). The Nicolet population is localized on the ER/FL RD but does have habitat connection and immigration from natural dispersal of individuals from the neighboring populations in Michigan's Upper Peninsula (Grauer et at., (2019) . Research conducted in the 1980 on the Nicolet MPA indicated good evidence that the population was reproducing (100 – 150 marten) but track surveys showed 89% of the tracks were only <_20 km from the original release site (WDNR, 2011). In 2005, Woodford et. (2005) conducted a mark-recapture study in the Nicolet MPA that provided a population estimate of 71 +30 for the area sampled. That estimate was extrapolated to 221 + 61 for the Nicolet MPA and adjacent areas.

The WDNR has also conducted a 119-mile winter marten track survey since 1982 across the Nicolet side of the CNNF which includes approximately 28 miles in the Fourmile project area. In 2015-16, the 3-year moving averages for marten track rates showed a decline, but it was not as sharply as expected (Woodford, J. and C. Lapin, 2015) Some of these decreases could be attributed to the soft and deep snow conditions

present during these survey periods. These snow conditions likely led to reduced travel and activity by many northern forest mammal species during the survey period (Lapin C. and J. Woodford, 2014). In the Fourmile study area during the winter of 2016-17 there were 7 positive marten tracks reported. Also for that time on the Nicolet side, the 3-year moving average for the marten track rates were similar and relatively stable even though the marten track rates decreased by 55% on the Nicolet side (Figure 11).

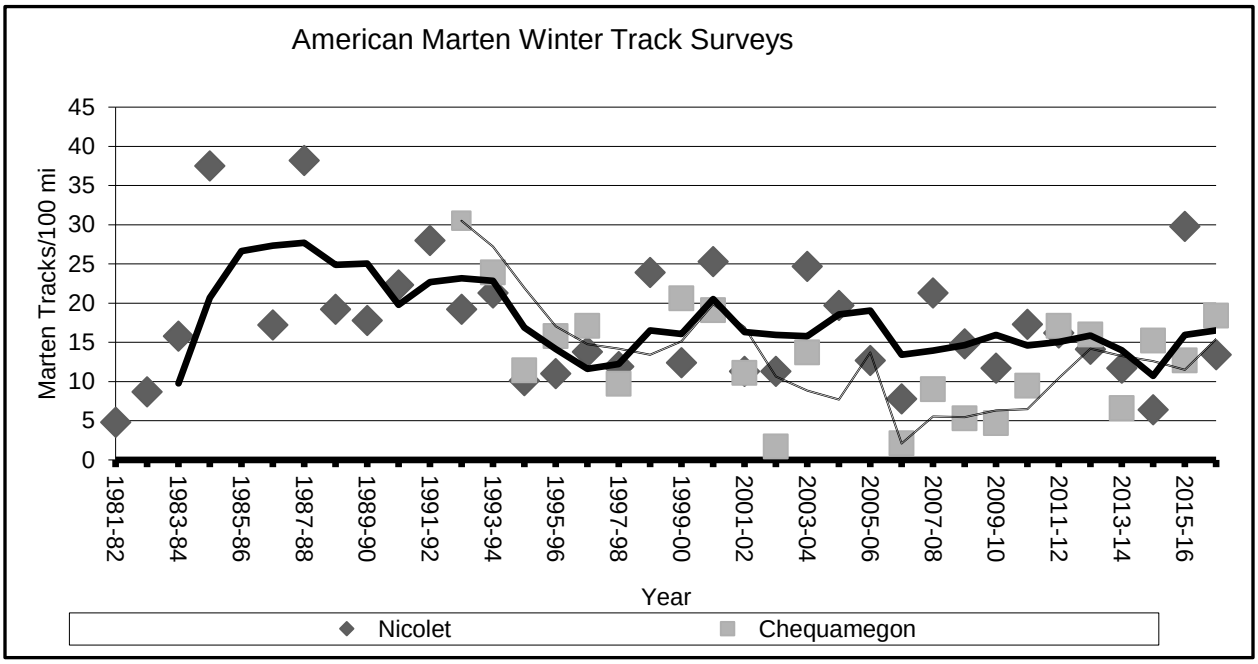


Figure 11. Marten track counts from 1981-2017 within and adjacent to the Nicolet and Chequamegon MPAs in northern Wisconsin.

Marten are generally considered a disturbance sensitive animal that avoids areas of intensive use. Timber harvest (other than clearcutting or removal harvest) and road construction and improvement work may temporarily (days to weeks) displace individuals due to avoidance of people, noise, etc. Selectively harvested hardwood stands, typically considered suitable marten habitat, generally are not harvested below 80 ft^2/ acre. Other structural characteristics such as snags, downed logs and a diversity of tree species will be maintained in stands proposed for harvest and will follow Forest Plan guidelines (USDA Forest Service, 2004a) (p. 2-6 through 2-8, 2-22, 3-10 through 3-11).

For the effects analysis of the Fourmile project, suitable habitat for marten is defined as mature upland deciduous forest containing a component of conifer as well as large woody debris. Specifically, these include forest types coded as northern hardwoods, (81-89) and hemlock (05, 20) that are at least 50 years old or uneven-aged, aspen types coded 91, 93, and 95 that are at least 40 years old and paper birch stands coded 92 that are at least 50 years old. It is assumed that aspen stands in the older (+50 years old) age classes, although they may be suitable for marten now would become unsuitable following a clearcut until the stands once again provide suitable structure. Aspen stands older than 50 years old are assumed to be suitable for marten use. On average, the CNNF best estimate is that this forest type would quickly deteriorate approximately from 60 years old and older (Theisen 2008). As this natural deterioration occurs, habitat conditions such as canopy cover for American marten are expected to be lost. The rate of this habitat loss is variable based on the stands condition from 60 years old and older.

Snag volume is unlikely to be sufficient for at least two more decades. Therefore, a regenerating stand following a clearcut is not expected to become suitable for marten until it is 40+ years old. Selection harvesting is not expected to have an effect on marten habitat suitability because the canopy closure before and after the cut remains ≥80%. For hardwood stands that are thinned (such as an initial cut to begin uneven-aged management), canopy closure is reduced to around 70% and is expected to return to ≥80% closure in five years or less. Payer and Harrison (2003) suggests stands are suitable for adults when mean basal areas reach 18 m^2 of basal area/ha, (about 80 ft^2/ac.) and tree heights reach a mean height of 9 m or about 30 ft. (this occurs around 20 years after clearcut) and ample snags are present. Along with reduced

canopy closure, marten are impacted by such treatments through increased risk of predation, loss of denning sites and foraging structure through the removal of both live and dead trees. These related effects are expected to dissipate in five years. Stands managed using even-aged silviculture are assumed to be unsuitable for a period of approximately 50 years following a treatment.

These effects to suitable marten habitat are within the following WDNR Best Management Practices (BMPs) for suitable marten habitat with even-aged and uneven-aged management goals (WDNR, 2016e):

a) Hemlock/Cedar pockets (a pocket is <2 acres): Encourage no harvest in these pockets, but allow removal of individual aspen, paper birch, and red maple trees. (Note: forest stands of hemlock and white cedar are suitable habitats).
b) Tree retention: Follow existing guidelines for green tree retention, snags, wildlife, and mast trees. Ten percent of the retained trees should be living wildlife trees ≥20 inches dbh, if present (Note: wildlife trees can include hollow or sound, live trees).
c) Woody debris: Design transport and removal paths to minimize crushing tree tops, limbs, and other woody debris. The vertical structure provided by post-harvest slash may provide an important habitat component for American martens.
d) Travel corridors: Consider maintaining travel corridors to avoid isolating suitable American marten habitat. Travel corridors are forested areas that connect one area of suitable habitat to another area of suitable habitat.
e) In addition, for forest stands with uneven-aged management goals:
    i. If the average stand diameter is ≤11 inches dbh, then maintain a minimum average residual basal area of 70-90 ft^2/acre across the stand.
    ii. If the average stand diameter is >11 inches dbh, then maintain a minimum average residual basal area of ≥85 ft^2 basal area/acre across the stand.

During the Forest Plan revision analysis of marten habitat, all age classes of northern hardwoods, 40+ year old aspen and 50+ year old paper birch forest types were considered suitable. In both that programmatic and this site-specific analysis, stand age is assumed to be positively related with the amount of debris and cavity trees in the stand. The assumption is necessary because the Forest does not have data on amounts of coarse woody debris present in each stand and because no minimum quantities have been scientifically described for this species in these forest types.

Limiting factors for the marten include habitat disturbance during denning season as well as a loss of existing denning habitat, such as tip-up mounds, and large tree stumps, hollow logs and trees, and a loss of mature forest conditions in general. Habitat alterations that promote a fragmented forest canopy, namely large (greater than 50 acres) clearcuts, may also negatively impact this species because of the reluctance of marten to cross open areas that lack hiding cover (Kyle, C. J. and C. Strobeck, 2003). Indirectly, marten may temporarily (~5 years) benefit from harvest treatments such as thinning and selection harvesting because these activities would improve habitat for prey species utilized by marten (Hunter, 1990), but the magnitude of this effect is unknown. Other limiting factors include predation, competitive interactions, incidental trapping, unsuitable habitat, poor recruitment, population isolation, low prey availability, and climate change that may explain limitations to successful population recovery (Volt, 2020).

Surveys

WDNR, Forest Service and UW-Madison conducted marten research on the ER/FL RD from 2015 to 2017 to quantify the current status of the marten population and to evaluate the long-term success of the reintroductions. During those three winters, 174 marten hair snare traps were set over 8 weeks between January and March as part of a non-invasive genetic mark-recapture study. A total of 141 marten samples were collected and identified across the District. The Fourmile project area contained 35 traps each year and had 15 positive marten samples collected over that time period. During the winters of 2018-19 and 2019-2020 the WDNR and Forest Service conducted another marten study that used trail cameras to identify individual animals to determine occupancy and estimate populations. There was a total of 72 trail camera sets across the ER/FL RD with 20 sets in the Fourmile project area and 8 within the 1-mile buffer. There was one positive observation in the project area and 4 within the buffer. The results of this study concluded that the population of martens within the NNF is stable and may be increasing (Vold, S. and J. Woodford, 2020).

Boundary and Scale of Effects Analyses:

Multiple spatial scales were used to evaluate meaningful effects to marten. For evaluating direct and indirect effects to the species, the project area was used. Any marten residing within the project area have the potential to be directly (destruction of den tree) or indirectly (loss of denning or foraging habitat) affected by the proposed activities. Cumulative effects to marten are analyzed at the scale of the project area and at the scale of the ER/FL RD and the Nicolet National Forest. Habitat is, however, considered Forest-wide for the purpose of trend analysis. These analysis areas are appropriate given that marten have displayed only limited dispersal since their reintroduction; generally, very few marten have traveled more than about 15 miles from their home territories (Woodford, J., D. MacFarland and M. Worland, 2013) Currently, no information yet exists that compels an analysis area that is so large as to include both the landbases of the CNNF (note population clusters as displayed in Figure 11).

The temporal scale of the cumulative effects analysis includes past actions, ongoing actions and those that are reasonably foreseeable. For past actions that are older than five years ago, the effects to pine marten habitat are undetectable in northern hardwoods forest types because within five years canopy gaps created during thinning harvests have closed considerably. Selection harvests are assumed to have no effect on marten because they do not result in a reduction in canopy closure below 80%. Even-aged harvest activities have long lasting effects because they take habitat that may be (or may have been) suitable for marten and make it unsuitable for approximately 40-50 years. Essentially, the effects of even aged treatments in the past are manifest in the records and projections of suitable habitat. These actions will be considered for each of the geographic areas described above. Reasonably foreseeable conditions become very speculative past 5-10 years. Although we may be able to simulate stand growth and development from seedling conditions, it is very difficult to assume stability of management objectives beyond 10 years based on the expected 'lifetime' of a Forest Plan. However, it is reasonable that stands between 40 and 49 years of age will be allowed to mature to 50+ years over the next decade. Therefore, the following definitions of short and long term are used in this analysis:

- Short-term: effects recover in 0 to 5 years, or in-growth over the next decade
- Long-term: effects lasting more than 5 years after implementation. Here it is assumed that implementation of future projects will occur two years after the decision for the project is signed
- Not reasonably foreseeable: in-growth beyond a decade.

Threshold of Effects

Viability of the introduced marten populations is unknown and continues to be studied by the WDNR and cooperators. Snow-tracking surveys have been used to monitor populations in the two reintroduction areas on the CNNF. During Forest Plan revision, two Species Viability Evaluation panels were convened to assess the risks/opportunities/impacts of the Forest Plan alternatives (USDA FS, 2004b, pp. B-25 to B-33). The Panels did not identify minimum population sizes or habitat areas and such thresholds have not been identified by any group (USFWS, USFS, GLIFWC, etc.) before or since. Consequently, the relative objective of maintaining or increasing the quantity or quality of marten habitat has taken the place of absolute viability objectives. The 2011 Management Plan for marten states the overall management objective is to establish and maintain two or more self-sustaining American marten populations in Wisconsin. Further it states that a conservative minimum viable population of 300 individuals (with a minimum of 50% females) is needed for a marten population to persist at least 100 years (WDNR, 2011).

Determination of Effects to American Marten:

National Forest system lands within the project area were evaluated for direct and indirect effects of alternatives to this species or its habitat. All harvest treatments were considered as well as road actions, opening improvement and impacts from fuel treatments.

Alternative 1 - *No Action*

Direct and Indirect Effects:

There would be no vegetation management under this alternative, therefore there would be no direct, indirect, or cumulative effects on marten or marten habitat from proposed actions. Upland hardwood habitat would remain unaltered; stands considered suitable marten habitat would continue to mature providing

potentially favorable habitat. However, aspen and birch stands would continue to age and lose canopy closure due to tree mortality from natural causes for this short-lived forest type which would result in this current suitable habitat becoming unsuitable in the future.

Currently, approximately 18,244 acres of suitable American Marten habitat exists within the project (all suitable timber types considered marten habitat). Of that, approximately 15,132 acres lies in northern hardwood stands or other similar timber types. The remaining 3,112 acres fall in the 40+ year old age class for aspen, mixed aspen and 50+year old paper birch class acres of suitable habitat. These acres of aspen/birch that are marten habitat makes up approximately 61% of the total aspen, mixed aspen and paper birch existing within project area (all ages). The remaining 39% (1,924 acres) of the aspen, mixed aspen and paper birch are not old enough (<40 years for aspen and <50 years for paper birch) to currently be considered American Marten habitat. However, the result of not implementing any timber management would lead to a passive loss of suitable aspen, mixed aspen and paper birch habitat over time. Because these are early successional forest types, these species have a limited life expectancy on the landscape (< 65 years old on avg.) if not maintained via natural disturbance or via silvicultural practices that regenerate the species (Theisen 2008). The 3,112 acres of aspen, mixed aspen and paper birch 50+ years of age is at risk of being lost as habitat through natural successional processes under this Alternative. These stands are currently suitable habitat for marten but are either at peak of maturity or already over-mature (depending on site quality) and are beginning to lose their marten habitat characteristics (i.e. canopy closure). This loss would be expected to be at least 40-65 years long while the next forest type grows and matures. The existing aspen, mixed aspen, and paper birch habitat (3,112 acres) would be lost through ongoing maturation under this alternative. Of these acres, approximately 1,647 ac (53%) is already 60+ years old and likely to be lost as habitat within 1-5 years (depending on site quality). The remaining acres of aspen, mixed aspen and paper birch habitat is within 5-20 years from being lost to maturation. It is anticipated that this habitat would recover in 50-65+ years from natural successional growth processes.

Cumulative Effects:

There will be effects to suitable habitat at the project level from aspen and birch stands aging and becoming unsuitable habitat over time. However, at the District and Nicolet land base there will be an increase in habitat at 2023 and 2028 (Table 22). See Cumulative Effects section below for details of effects.

Determination:

No impact. There will be an increase of suitable habitat in 2023 and 2028 (Table 22) mainly from an ingrowth of aspen birch forest types that have reached the age where habitat conditions are rapidly becoming suitable for use by American marten.

Alternatives 2: *Action Alternative*

Direct and Indirect Effects

Within the project area there exists18,244 acres of suitable habitat for marten (Figure 11 and Table 22). Approximately 15,132 ac of this habitat is comprised of northern hardwood forest and/or hemlock, while the remaining 3,112 acres is aspen and birch. About 10,470 acres (57%) of this total suitable habitat will not have any harvest treatments and will remain suitable habitat until they subside naturally or are managed in a future project; 7,182 ac. hardwood, 1,414 ac. hemlock, 360 ac. northern hardwoods/hemlock and 1,517 acres of aspen and birch (Figure 11).

In suitable hardwood habitat there is a total of 6,176 acers of harvest treatments and of that 5,646 ac. are planned to have individual tree harvesting that will be selection cuts and all Argonne Experimental Forest harvest treatments. The canopy closure in 4,866 ac. (77%) of these stands, will remain at or above 80% and thus remain suitable habitat immediately after harvest. The 780 acers that would become unsuitable immediately after harvest is due the forest canopy falls below 80% crown closure. However, five years post treatment these 780 acres are expected to return to 80% or more and again become suitable habitat. There will be 126 ac. of clearcut and salvage cuts in preferred upland mature hardwood habitat that will result in a long-term loss of only 0.7 % in the project area. The remaining 404 acres will have improvement and thinning treatments that will result in the habitat remaining suitable immediately after harvest.

In aspen and birch stands that are suitable habitat, there will be 1,568 acres (50%) harvested within a 10-year cycle. Approximately 1,265 ac. would be made unsuitable for ~40 years due to clearcut harvests

treatments. However, mature aspen and birch types are at or entering into a growth stagnation and deterioration phase where suitable habitat characteristics are beginning to decline from natural regression processes of succession. The consequences of this aging are a natural conversion of the habitat to longer lived species with an establishment period in which the canopy closure is expected to drop below the desired 80% cover favored by marten and thus become unsuitable habitat. Our experiences with natural succession from aspen to the next forest condition indicates that habitat conditions are not equally exchanged from mature/over mature aspen types to mature northern hardwoods or other forest replacement types. As a result, these aspen and birch stands would become unsuitable martin habitat over time with or without timber management occurring.

The implementation of these harvest treatments in 2023 (906 acres hardwoods, 1,265 acres aspen/birch) will result in a 6.45% reduction in marten habitat (Table 22). This is mainly from the clearcut and shelterwood cuts occurring in aspen habitats and selection cuts in hardwood stands with a DBH < 10 in. These aspen/birch saw log sized habitat types have been identified as being “highly used” by marten (Dumyahn, J.B., Zollner, P.A., and J.H. Gilbert, 2007). Even though this habitat has been documented as winter habitat for marten in that study, more localized marten research on the ER/FL RD classified aspen, aspen/conifer mix stands as suitable but not preferred marten habitat (Vold and Woodford, 2020). The more abundant habitats types of deciduous, mixed deciduous and coniferous were defined as preferred habitat (Vold and Woodford, 2020). These hardwood types are also the least impacted suitable marten habitat by harvest treatments within the project area. The remaining 303 acres of aspen and birch stands would have thinning treatments and would remain suitable after harvest. As a result, there will be 16,046 ac (88%) of suitable habitat in the project area that will have no harvest treatments, or the habitat will remain suitable immediately after harvest (Figure 11). Five years after implementation in 2028, the project area’s suitable habitat will increase to 98.3% of pre-harvest levels mainly due to an addition of 274 ac. from in-growth of maturing stands and also individual tree harvesting that will be selection cuts and all Argonne Experimental Forest harvest treatments (780 ac.) becoming suitable again.

In MA 2B stands suitable for marten that have harvest treatments, prescriptions will incorporate MA 2B Reserve Tree Guidelines (Chapter 3) relative to tree numbers and diameters to even and uneven-age managed stands, where existing tree diameters allow (Forest Plan p. 2-22). These and other harvest treatments will not all be implemented at one time, as a result suitable undisturbed habitat will exist across the project area as refugia while logging is occurring over several years (Figure 11). Also, creation of critical snag habitat will occur with Forest Standard and Guidelines – Reserve snag guidelines for even-aged and uneven aged managed stands. This will reserve all dead snags and live den trees up to 10 trees/snags per acre, unless they present a safety concern. There will be an emphasis placed on using the largest snags and den trees available. Those snags felled for safety reasons should be left on site as coarse woody debris wherever possible and if needed, additional snags will be recruited from live reserve trees (Forest Plan p. 2-14).

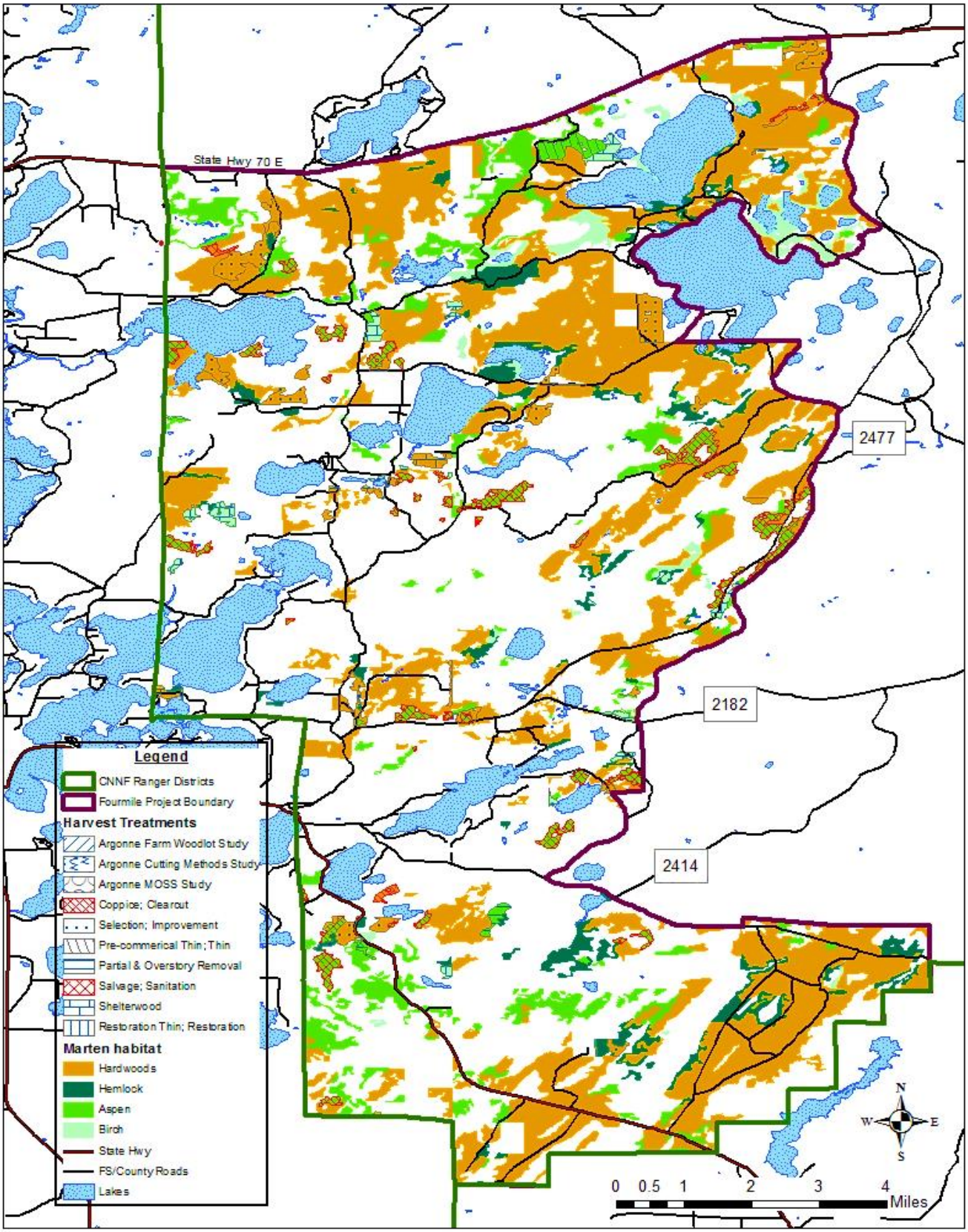


Figure 12. Suitable marten habitat within the Fourmile Project area with harvest treatments that result in habitat being unsuitable long term (50 years).

Table 22. Marten habitat at the scales of the Fourmile project, ER/FL and NNF Landbases. For The 2023 and 2028 projections, the effects of all other projects within the analysis area are included.

Project Area	Alt. 1		Alt. 2	
Current Condition (2018)	18,244		18,244	
Following Implementation (2023)	19,237	5.44%	17,066	-6.45%
Five years after Implementation (2028)	19,547	7.14%	18,156	-0.48%
Eagle River - Florence Ranger District	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	154,562		154,562	
Following Implementation (2023)	153,269	-0.84%	153,694	-0.56%
Five years after Implementation (2028)	153,809	-0.49%	162,696	5.26%
Nicolet National Forest	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	314,594		314,594	
Following Implementation (2023)	319,788	1.65%	317,618	0.96%
Five years after Implementation (2028)	340,501	8.24%	338,111	7.79%

Prescribed fire and wildlife opening maintenance work will not occur in suitable habitat for marten and thus there will be no negative affects to this species from those activities.

Road management within marten habitat with the action alternatives would result in the following: 98 miles of decommissioned roads, 4.6 miles reconstruction and remain open, 21.4 miles reconstruction than close, 0.70 miles new construction than close and 35.8 miles of roads converted to trail. Road construction and improvement disturbances may temporarily (days to weeks) displace individuals (due to avoidance of people, noise, etc.).

Cumulative Effects:

Currently there are approximately 154,562 acres of suitable marten habitat within the ER/FL RD (Figure 1) and 314,594 acres of suitable habitat on the Nicole landbase. At the time of project implementation (2023) there would be a small decrease and increase in suitable habitat at the District and Forest levels respectively with the Action Alternative (Table 22). However, by 2028 the Action Alternative would have an increase in suitable habitat at the District (5.3%) and the NNF landbase (7.8%). This increase across the District will occur mainly from the ingrowth of suitable aspen habitat (12,209 ac). This trend of increasing suitable habitat would continue at the Nicolet landbase level at the time of implementation and 5 years post implementation with an increase of almost 24,500 ac that would also come from an in-growth of aspen habitat (Table 22).

On non-FS lands inside and within the 1 mile buffer to the project area, there are about 8,500 acres of habitat that may be suitable to marten (Table 4 and Table 5). Assuming that the age structure of the northern hardwoods forested acres (4,505 ac) is similar to the hardwoods on FS land, most of those acres are suitable now. Within the project area and 1-mile buffer over the past 10 years there has been 61 ac. of aspen and birch management (47 ac. clearcut, 10 ac. thinning and 4 ac. shelterwood). There was also about 145 ac. of hemlock harvested, however these stands will remain suitable habitat due to harvest treatments (selection and thin cuts). There was also about 415 ac. of upland hardwood management that will also remain suitable due to the harvest treatments being selection and thinning cuts. In the future in these areas 1-mile buffer over the past 10 years there has been 230 ac. selection cuts in upland hardwoods and 125 ac. of aspen harvest (77 ac. clearcut and 48 ac. other) along with 13 ac. aspen planting. In the future within these areas there is planned 231 ac. aspen clearcutting and 22 ac. with thinning harvests proposed. Also being planned is 1,065 ac. of selection/release cuts in northern upland hardwoods along with 79 ac. of selection cuts in hemlock stands. Both of these forest types will remain suitable habitat after harvest due to the canopy closure will remain at or above 80%. Based on the abundance of suitable habitat, implementation of these management plans on non-FS lands is unlikely to have a detrimental effect on this species. However, there are no records of marten utilizing these non-FS lands.

For context, across the entire Chequamegon and combination of Chequamegon and Nicolet landbases there is a projected trend for increasing marten habitat (Figure 13 and Figure 14). These projected increases are due to ingrowth of aspen habitats and mixed aspen habitat.

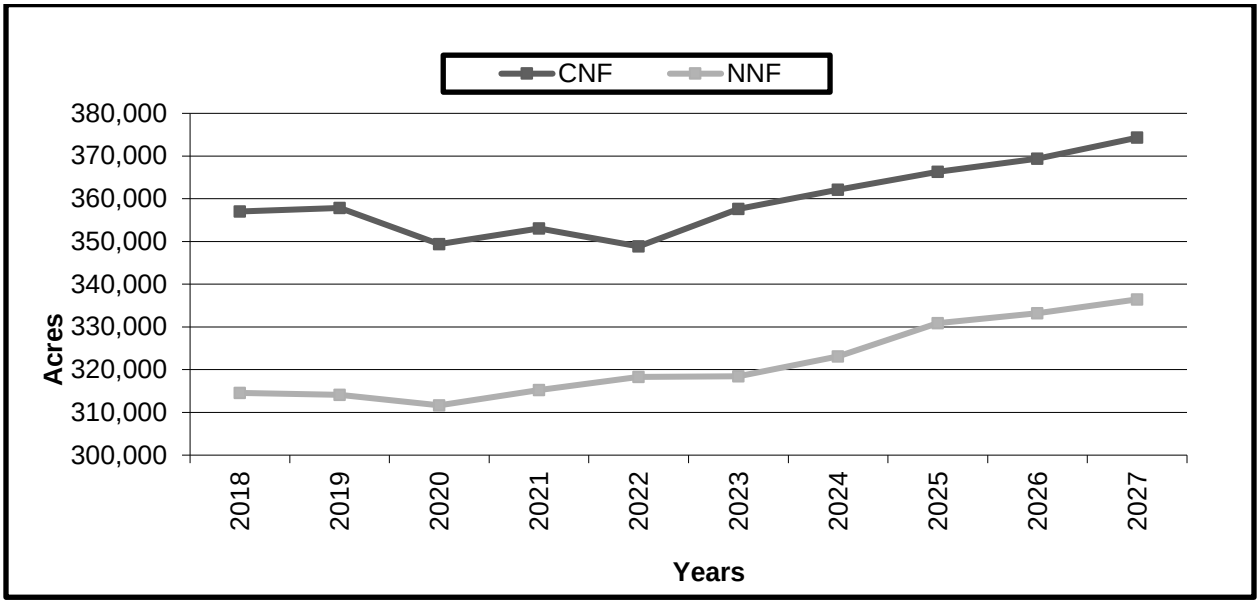


Figure 13. Marten habitat trends for each Chequamegon and Nicolet Landbases 2018-2027.

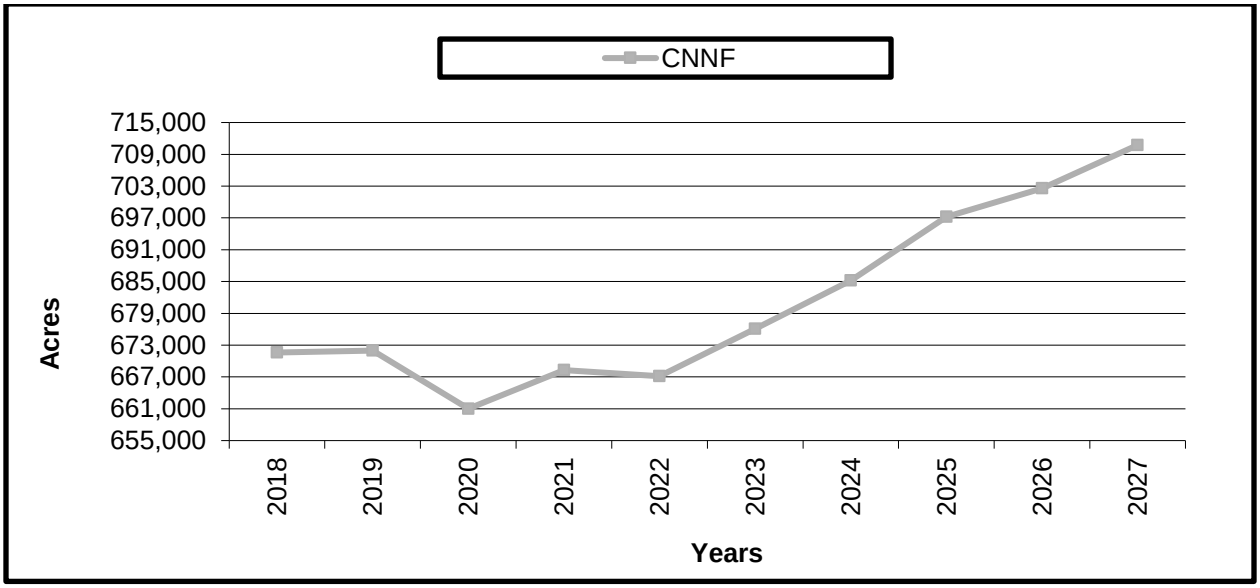


Figure 14. Marten habitat trends for combined data of Chequamegon and Nicolet Landbases 2018-2027.

Determination:

May impact, but not likely to adversely affect due to temporary reduction in suitable habitat. Though marten are assumed to be present in the Fourmile project area, the impact is to habitat. Within the project area immediately after implementation there is a 6.5 % loss of suitable habitat with the action alternatives. Also, five years post-harvest activities there is still a reduction in suitable habitat in the project area but only at 0.5%. Additionally, there will only be 126 ac. of clearcuts and salvage cuts in preferred upland mature hardwood habitat that will result in a long-term loss of only 0.7 % in the project area.

Design Features:

Forest Plan guidelines for reserve tree management (USDA Forest Service, 2004a) would be followed for the proposed harvest areas. Snags and den trees up to 10 trees/snags per acre would be reserved unless they present a safety concern. The guidelines include restricting access to portions of proposed harvest stands, as necessary, to protect den sites should marten move into the project area (p. 2-20).

Connecticut Warbler (*Oporornis agilis*)

The Connecticut warbler, a Neotropical migrant, has been found in association with fifteen different forest types on forests in Michigan, Minnesota, Wisconsin, and the provinces of Canada (Kudell-Ekstrum, 2002). Breeding habitat consists of spruce-tamarack bogs, muskeg, poplar woodlands, moist deciduous forests, and jack pine. In northern Wisconsin, they are most often associated with lowland conifer and jack pine and there is a notable population centered in the jack pine belt in the northwest portion of the state. In Minnesota, Connecticut warblers occur most consistently in lowland conifer habitat within a matrix of large patches of lowland and upland conifer habitat (Lapin, 2013). Also important is a forest structure that is generally open with a dense shrub and herb layer up to one meter high and ericaceous species in the understory (Niemi et. al 2014). This well-developed shrub layer may be the most important habitat feature for this bird (Kudell-Ekstrum, 2002). With respect to habitat age and stand density, habitat for the species includes mature lowland coniferous habitat; mature jack pine with a dense shrub understory; pole-sized jack pine; pole-sized ash, elm, and red maple; red pine; and pole-sized mixed swamp conifer. Connecticut warblers nest on the ground in a small hollow or on a moss mound in bogs or in grasses or weeds or at the base of a shrub (Kudell-Ekstrum, 2002).

On the CNNF, this species is found in low numbers on both the Nicolet and Chequamegon sides. There are approximately 19 occurrences recorded from the Nicolet National Forest Breeding Bird Survey at 16 sites (Nicolet Breeding Bird Surveys 1987–2015, but no birds have been confirmed at survey points since 2003). Additionally, there are approximately 72 observations on the Chequamegon for survey years 1992–2007 (Danz, N.P., A. Bracey and G.J. Niemi, 2008). The Breeding Bird Surveys have recorded low numbers of individuals on both landbases, in years when they are detected. The observations occurred in a variety of habitats that include conifer lowland habitat types (northern white cedar, mixed swamp conifer, and mixed black ash swamps), red pine, and jack pine. Overall observations across the CNNF appear to be higher in the north and lower in the south.

Numbers of Connecticut warbler's observations decreased between years 1989–2002 for the Nicolet National Forest. Similar decreases were reported from the North American Breeding Bird Survey data for 1989–2000 (Howe, R. W. and L. J. Roberts, 2005). Trend data for the northern portion of the Nicolet should be looked at cautiously, since some years this warbler is not reported at all during the two-day survey period, and other years only one bird is detected and only on one occasion was two birds reported. Niemi et. al. (2014) reported that 20 years of survey data from the NNF BBS did not meet their commonness criteria to test for Connecticut warbler's population trend. However, they did report the species had declined 7.1% per year in the Chippewa and 8.4% per year in Superior NFs over that time period. Another study Sauer et. al. (2016) showed declines in the Eastern BBS Region of 1.9 % and in the BCR 12 of 2.1%. There were even greater negative trends in Wisconsin, Manitoba, and the continental United States.

Limiting factors to the Connecticut warbler include:

- Habitat loss / degradation - forest conversion to agriculture
- Striking buildings, lighthouses, or towers during migration (Nature Serve, 2016c).
- Loss of pine barren forest and jack pine from budworm and fire suppression are threats on the CNNF (Kudell-Ekstrum, 2002).

Connecticut warblers have not been reported at any of the semi-annual breeding bird survey point count locations within or near the project area since 1987. There were also no occurrences from road point surveys conducted in or near the project in the years that these surveys were conducted (1992-2000). Finally, 2010 and 2011 project level surveys conducted in suitable habitat with proposed harvest treatments did not locate any occurrences of this species.

Boundary and Scale of Effects Analyses

Two spatial scales were used to evaluate meaningful effects to Connecticut warbler. For evaluating direct and indirect effects to the species, the project area was used. Connecticut warblers nesting or foraging within the project area have the potential to be directly (destruction of nests) or indirectly (loss of nesting or foraging habitat) affected by the proposed activities. Cumulative effects to this species are analyzed at the scale of the project area. If appropriate, it was analyzed up to the scale of the CNNF landbase. This analysis area is appropriate because (1) little is known about the population biology of the species, (2) the species occurs at low densities (relatively few observations reported), and (3) based on the availability and abundance of jack pine and lowland conifer habitat, its abundance is likely related to the availability of these types at the larger scale.

The temporal scale of the cumulative effects analysis includes actions that have occurred over the past five years, are ongoing and those that are reasonably foreseeable and specific to suitable habitat. Actions within the last five years may not have been incorporated into the Forest Service vegetation database and were tracked separate from older past actions, the effects of which are assumed to be manifested in current conditions (as represented in the vegetation database).

On National Forest system lands within the project area, approximately 3,527 acres are currently classified as suitable Connecticut warbler habitat. Forest cover types, (FS Veg codes) 01, 12 - 15, 18, 19, 22, 48, and 71 are considered suitable habitat for Connecticut warblers if stands are 30 years old or older (St. Pierre, M., 2010).

Threshold of Effects

In the species viability evaluation process for the forest plan revision (Schenck, T., C. Chaney, T. Doyle, M. Shedd, M. St. Pierre & S. Hess-Samuelson., 2004), no minimum numbers of Connecticut warbler or acres of habitat were identified. However, Alternatives 2-9 and the selected alternative were judged to result in beneficial effects to this species as a result of standards and guidelines protecting the species and maintenance of the jack pine forest type, (forest plan p. 2-19 and 20) by harvesting jack pine in blocks of 100 acres or more (forest plan, p. 2-21). Additionally, no management would occur in mature lowland conifer habitat where this species is most abundant.

Determination of Effects to Connecticut Warbler:

National Forest system lands within the project area were evaluated for direct and indirect effects of alternatives to Connecticut warbler and their habitat and considered effects of timber harvest, opening improvement, road activities, fuels treatments and cultural treatments.

Alternative 1 - No Action

Direct, Indirect, and Cumulative Effect

There would be no direct, indirect, or cumulative effects to Connecticut warblers or their habitat. No vegetation or other management would occur with this alternative under this project. Existing available habitat and conditions for Connecticut warblers would remain the same.

Determination: No Impact**.**

Alternative 2 - Action Alternatives

Direct and Indirect Effects

There are 8,814 acres of suitable Connecticut warbler habitat in the project area. This includes 7,973 lowland conifer, 608 ac. and jack pine 233 lowland hardwoods. In the project area, harvest treatments proposed in suitable habitat total 80 acres: include 75 ac. jack pine (15 ac. clearcut, 16 ac. shelterwood, 11 ac. thinning and 33 ac. salvage). There would also be a 5-ac. restoration thinning in a lowland black spruce stand. Even with these cuts there would be an increase in habitat in the project area due to ingrowth of jack pine and lowland conifer. This upward trend will continue to 2023 (0.21%) and 2028 (0.87%) with more ingrowth of jack pine and lowland conifer.

Table 23. Connecticut warble habitat at the scales of the Fourmile project, ER/FL and NNF Landbases. For The 2023 and 2028 projections, the effects of all other projects within the analysis area are included.

Project Area	Alt. 1		Alt. 2	
Current Condition (2018)	8,814		8,814	
Following Implementation (2023)	8,885	0.81%	8,832	0.21%
Five years after Implementation (2028)	8,890	0.87%	8,890	0.87%
Eagle River - Florence Ranger District	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	55,043		55,043	
Following Implementation (2023)	54,817	-0.41%	54,764	-0.51%
Five years after Implementation (2028)	55,109	0.12%	55,109	0.12%
Nicolet National Forest	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	103,855		103,855	
Following Implementation (2023)	103,666	-0.18%	103,613	-0.23%
Five years after Implementation (2028)	104,816	0.93%	104,816	0.93%

Road management within Connecticut warbler habitat with the action alternatives would result in the following: 3.2 miles of decommissioned roads, 0.85 miles reconstruction and remain open, 1.0 miles reconstruction than close, 0.12 miles new construction than close and 0.60 miles of roads converted to trail. There would be no impact from any alternative's road management activities due to the limited amount of this work occurring in this warbler's habitat.

Prescribed fire and wildlife opening maintenance work will not in suitable habitat for Connecticut warbler and thus there will be no negative affects to this species from those activities.

Cumulative Effect.

At the District level after project implementation there would be a decrease (0.5%) in habitat mainly due to jack pine harvests planned from Northwest Howell, Longrail and Fishel projects. In 2028, there would be an increase (0.1%) in habitat from ingrowth that would return suitable habitat acres near 2018 original levels. At the Nicolet landbase level there is a similar trend in reduction at 2023 and an increase in 2028 with the 2028 amount larger than the original value in 2018.

No additional effects would be expected from non-Forest acres within and outside the project area due to past and future activities on those lands are minimal. Past actions included 67 acres of clearcuts (1%) and in the future there is only 116 acres of clear cuts (2%) within the total 5,296 acres of suitable habitat.

Determination

No impact. Habitat at project level increases following treatments and also at 5 years post-treatment levels. Small decreases in habitat at the District and Forest levels except 2025. There were no birds detected during project surveys and there is almost 8,806 ac. of suitable habitat that do not have proposed treatments. There are also large amounts of suitable habitat at all levels of FS and non-FS lands that do not receive treatment and are available (Table 4and Table 5).

Black-backed Woodpecker (*Picoides arcticus*)

Historically in Wisconsin, black-backed woodpeckers (BBS) were once known from the forested portions of the state including the southeast. However due to logging in the 1800s to the early 1900s, particularly the exploitation of pine, the species has been restricted to the northern third of the state (Robbins, 1991b). Black-backed woodpeckers persisted in lowland conifer areas such as tamarack bogs and likely took advantage of burned pine/slash areas that would have been abundant in the early 1900s. This was mainly a result of the pine volume left in the woods and the fires set to eliminate the risk of uncontrolled wildfires. Other than in coniferous lowlands, habitat for black-backed woodpecker was scarce after the early logging era. With the creation of the National Forests and the work of the Civilian Conservation Corp in the early part of the last century, many young stands of primarily red and jack pine were established in the northern half of Wisconsin. Many of those stands provide potential habitat today because they are mature enough that mortality of some trees provides foraging areas. Additional habitat is created as a result of fires, insect outbreaks, and other natural events like windstorms and tornados.

In the Lake States, they are known to occur in low numbers in habitats that include pole and mature size spruce or fir, pole or mature pine (red, white or jack), tamarack or white cedar. In the northern tier of Wisconsin, the birds prefer tamarack stands, recently burned pines and other mixed conifers (Johnson, 2006). BBS are also known to use spruce bog habitat and mixed forest with a hemlock component (Short, L.L., 1982) (Corace, R. G., III, N.W. Lapinski and S.J. Sjogren, 2001).

Apfelbaum et. al. (1981) found that black-backed woodpeckers foraged almost exclusively on severely burned, mostly dead, jack pine that contained an abundance of wood-boring insects in a study in the Great Lakes Region. The species is considered an irruptive species, with more frequent numbers reported during years following outbreaks of conifer-killing diseases (Corace, R. G., III, N.W. Lapinski and S.J. Sjogren, 2001). Several irruptions of the species have been noted across the United States (Van Tyne, J., 1926) (Axtel, H.H., 1957) (Yunick, R.P., 1985). Northern Wisconsin is considered the southern edge of this species' breeding range (Corace, R. G., III, N.W. Lapinski and S.J. Sjogren, 2001).

On the CNNF, the black-backed woodpecker prefers decadent jack pine, balsam fir, tamarack, cedar, white spruce, and black spruce stands impacted by fire, disease or wind throw, for foraging and nesting sites. The CNNF contains approximately 7,700 acres of upland habitat (jack pine and balsam fir 60+ yrs. old) and another 186,000 acres of lowland swamp conifer habitat, which is considered to comprise approximately 90 % of the species habitat across the CNNF (USDA Forest Service, 2004b). With the advent of spruce decline and jack pine budworm, observations of black-backed woodpeckers have increased over the last several years. During winter 2008 through fall 2010, approximately 15- 20 individual woodpeckers were observed by Forest Service biologists and others across the northern portion of the Nicolet landbase. At least one nest was confirmed in June of 2008, and a second was reported but not confirmed. Some observations were also reported from the Chequamegon landbase as well. Although sightings have increased on the CNNF, no population estimates can be made.

On the CNNF, it will likely continue to exist in low numbers and erupts in abundance when suitable habitat becomes available with outbreaks of spruce and jack pine mortality. An analysis of Breeding Bird Survey data from 1966-1996 shows considerable long-term increases in some populations of this species, but no significant population trends. This population dynamic is supported by Johnson (2006) that reported that with the event of widespread drought and fire (suitable habitat), it could become temporarily common. Also in Michigan fire in pine forests can result in high nesting densities (Youngman J. A. and Z. G. Gayk, 2011). However, it was probably always an uncommon species in the state and will most likely remain so.

Limiting factors to the black-backed woodpecker include:

- Habitat disturbance to nesting trees during the nesting season
- Loss of pole and mature conifer forest
- Intensive salvage logging or other losses of the dead and dying component within pole and mature conifer forest salvage
- Fire suppression

All of these limiting factors have a common element that limits this species. Because black-backed woodpeckers are dependent upon disturbance to create desired habitat, the loss of large amounts of dead

and dying conifer habitat on the landscape becomes limiting for the species. This loss occurs either through prevention of events like wildfire or by salvage logging after fire or other events (insect/disease outbreaks, wind disturbance events, etc.) that create desired habitat conditions to allow the species to erupt (Corace, R. G., III, N.W. Lapinski and S.J. Sjogren, 2001). In addition to prevention or salvage of disturbance events, changes in age class from decadent conditions (60+ years on CNNF) to young age classes or conversion from conifer to hardwoods also can reduce habitat thus further limiting the species.

In the analysis of effects, suitable habitat for black-backed woodpecker is defined as decadent (60+ year old) jack pine and decadent balsam fir (FSVeg forest type 1 and 24, respectively) and lowland conifer forest types (FSVeg forest type 12-15, 18, 19, and 22; including upland white cedar) of all ages. Additionally, dead or dying individuals of red pine, white pine, hemlock or spruce may be used by the species as forage sites and nest trees (Corace, R. G., III, N.W. Lapinski and S.J. Sjogren, 2001). Healthy stands of these forest types (red pine, white pine, hemlock, and spruce) are not categorized as suitable habitat in this analysis. In the project area there is only 34 ac. of suitable habitat that has proposed treatment. Surveys conducted in pring 2016 did not document any occupancy of black back woodpeckers.

The NNF BBS has documented only 6 observations and 4 of them are on the ERFL but none are within the project area. All suitable habitats (181 acres) with proposed harvest treatments were surveyed in 2010 and no birds were recorded.

Boundary and Scale of Effects Analyses:

Two spatial scales were used to evaluate meaningful effects to black-backed woodpecker. For evaluating direct and indirect effects to the species, the project area was used. Black-backed woodpeckers nesting or foraging within the project area have the potential to be directly (destruction of nest tree) or indirectly (loss of foraging habitat) affected by the proposed activities. Cumulative effects to black-backed woodpeckers were analyzed at the scale of the project area and at the scale of the entire CNNF. Such a large analysis area is appropriate because 1) little is known about the population biology of the species, 2) the species is highly mobile, and 3) based on the ephemeral nature of its habitat, black-backed woodpecker abundance is likely related to resource availability at the landscape or regional scale.

The temporal scale of the cumulative effects analysis includes actions that have occurred over the past three years, ongoing actions and those that are reasonably foreseeable. Three years after a tree dies, the suitability of dead conifer stands or individual trees is greatly diminished because the snags no longer harbor abundant insects on which to forage.

Threshold of Effects

In the SVE process for the forest plan FEIS, no minimum numbers of black-backed woodpecker or its habitat were identified. The majority of suitable habitat for the species on the CNNF is lowland conifer forest types, which would not be harvested under any vegetation management project. The remaining habitat for the species is conifers in the older (~60+ year) age classes.

SVE panelists determined that all of the forest plan revision alternatives would have a beneficial effect on the black-backed woodpecker except for Alternative 1(current forest plan) which would have no effect, (USDA Forest Service, 2004a) p. J-86). The action alternatives analyzed in the forest plan revision projected between a 29 % and a 36 % decrease in the amount of upland habitat available to the black-backed woodpecker after 10 years of forest plan implementation. All action alternatives in the forest plan FEIS were expected to have a beneficial impact on the black-backed woodpecker despite the projected losses of upland habitat.

Reserve tree guidelines, emphasis on retention of conifers in upland/lowland transition zones, salvage deferral, and the stability of the majority of the species habitat (lowland conifers) under the revised forest plan were expected to maintain the viability of the species.

Determination of Effects to Black-backed woodpecker:

National Forest system lands within the project area were evaluated for direct and indirect effects of alternatives to this species or its habitat. Harvest treatments were considered as well as opening improvements and road actions.

Alternative 1 - *No Action*

Direct and Indirect Effects

No actions would occur within the project area under the EA. However, past decisions would be implemented which include two stands for spruce decline salvage harvests. Upland conifer stands that are decadent now would remain so and would eventually convert to another forest type. As the trees die, they may be utilized by black-backed woodpeckers. Lowland conifer forest would remain habitat for the species for the foreseeable future.

In the project, there are about 9,340 acres of lowland conifer forest and 250 acres of jack pine. These forest types are considered primary lowland and upland habitat utilized by this species. Spruce forest types 16 and 17, are not considered habitat unless diseased, dying, or recently killed. In the project area, some diseased spruce stands have been identified and are planned for harvest. These stands total 236 ac. are likely suitable habitat because they are in the early stages of decline and could be used until harvested.

Cumulative Effects

Losses of mature upland black-backed woodpecker habitat as a result of No Action would occur over a period of decades as stands break up. During break-up, the conifer stands are likely to be used by the species, and individual dead or dying trees are used for a short time while insects remain present. Presently in the project area, there are about 2,594 acres of upland spruce older than 60 years, and about 250 acres of jack pine, which could provide habitat in the future. Under this alternative, these habitats would likely convert to other types such as hardwood, or a mix of spruce, balsam fir, red pine, white pine, and jack pine and may or may not provide black-backed habitat in the future. Regardless, abundant habitat remains available in other preferred forest types, especially lowland conifer. Since there are no additional actions beyond the status quo proposed and no direct or indirect effects experienced, there is no cumulative effects.

Determination

No impact.

Alternative 2 - Action Alternatives

Direct and Indirect Effects

The project area contains about 9,588 acres of suitable habitat, of which 9,340 acres (97 %) is lowland conifer that would not be treated. Suitable habitat affected by implementation of this project include harvest treatments for 60 ac. of jack pine (11 ac. clearcut, 16 ac. shelterwood and 33 ac. salvage) and 5 ac. black spruce that will be thinned. This treatment would remove most of the dying conifer component, except for reserved areas.

These harvest treatments would result in an immediate loss of 0.6% suitable habitat in the project area that would last more than 5 years. Since there would also be no in-growth of suitable habitat this loss would still be present in 2028 (Table 24). After harvest is completed there will be 60 ac. of jack pine that would be replanted to jack pine and it would once again become favorable habitat after 30 years. Black-backed woodpecker may also find conifer snags that provide some resources to them scattered throughout other forested stands in the project area. For example, stands in which white pine, red pine, tamarack or balsam fir is a component, are used at times, but the density of resident black-backed woodpeckers are generally low. No black-backed woodpeckers were observed in this stand during 2017 surveys.

Table 24. Black-backed woodpecker habitat at the scale of the Fourmile project, ER/FL, and Nicolet landbase. For the 2023 and 2028 projections, the effects of all other projects within the analysis area are included.

Project Area	Alt. 1		Alt. 2	
Current Condition (2018)	9,588		9,588	
Following Implementation (2023)	9,588	0.00%	9,529	-0.6%
Five years after Implementation (2028)	9,529	-0.62%	9,529	-0.6%
Eagle River - Florence Ranger District	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	54,198		54,198	
Following Implementation (2023)	53,643	-1.02%	53,583	-1.1%
Five years after Implementation (2028)	53,609	-1.09%	53,609	-1.1%
Nicolet National Forest	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	92,988		92,988	
Following Implementation (2023)	92,257	-0.79%	92,197	-0.9%
Five years after Implementation (2028)	92,286	-0.75%	92,286	-0.8%

Road management within black-backed woodpecker habitat with the action alternatives would result in the following: 2.5 miles of decommissioned roads, 0.85 miles reconstruction and remain open, 0.95 miles reconstruction than close, 0.17 miles new construction than close and 0.45 miles of roads converted to trail. There would be no impact from any alternative's road management activities due to the limited amount of construction work occurring in black-backed woodpecker habitat. Also, black-backed woodpeckers do not avoid road edges, openings or open corridors and have been observed either foraging or nesting in or near such areas.

Prescribed fire and wildlife opening maintenance work will not occur in suitable for black-backed woodpeckers and thus there will be no negative affects to this species from those activities.

Cumulative Effects

At the District level, there is currently 54,198 ac. of suitable habitat that will have a small reduction of 1.1% after implementation and in 2028. These reductions would occur from jack pine harvests within the Fishel, NW Howell and Phelps project areas. For the Nicolet landbase there is 92,988 ac. of suitable habitat that will have similar reduction at those times with these reductions being from jack pine harvest on the LK/LA RD (Lakewood SE and McCaslin) (Table 23).

On non-FS lands inside and adjacent to the project area, there are about 5,296 acres of habitat that may be suitable to black backed woodpeckers (Table 4and Table 5).

Past land practices on these non-FS lands total 119 ac.; spruce thinning 57 ac., spruce clearcuts 31 ac., and clearcutting 22 ac. cedar and 9 ac. fir. Future management involving suitable habitat include planting 12 acres spruce and harvest on 225 ac.; clear-cutting 116 acres, shelterwood 60 ac. and thinning 49 ac. Harvest treatments that would maintain suitability of habitat after harvest would occur on 49 acres.

The black-backed woodpecker has never been abundant in on the ER/FL RD and likley exists at low densities until broad-scale habitat conditions change. This would occur when suitable habitat becomes more abundant with events like dying conifer (insect infested), low intensity fires, windthrow, or beaver flooding.

In recent years, black backed woodpeckers have occasionally been located in spruce and other pine forests that have been infected by disease. Currently there are still numerouse spruce stands scattered across the District which have been infected by spruce bud worm (Dan Reynolds and Katie Theisen, personal communication, 2018).

Many of these dying and/or dead stands will be harvested in the future but until that time they are providing habitat for the woodpeckers. Management objectives are in place to salvage this dead and dying timber whenever timber volumes are economically feasible to harvest. This could result in a reduction of habitat for this species and potentially prevent or restrict the eruption of the local population. However, because

slavage harvest is only done where economically feasible, small pockets of this habitat are probably always present on the landscape. Also, where disease, windthrow and flooding occurs in the various non-management areas (Whisker Lake, Blackjack, and Headwaters Wilderness areas), black-backed woodpecker habitat will be left undisturbed.

Determination

May impact individuals but is not likely to cause a trend to Federal listing or loss of viability. There were no black-backed woodpeckers detected in the project area during 2016-17 surveys. However, if occupancy occurs in these stands with harvest treatments there is 9,525 ac. of unaffected suitable habitat available throughout the project area. Suitable habitat (acres) does declines by 1% following treatments and remains at this level for 5 years post treatment within the project area, District and NNF levels. However, there is about 5,296 ac. of habitat in non-Forest lands in and around the project area (Table 4 and Table 5). Also, there is scattered stands of spruce stands effected by spruce bud worm that are available as suitable habitat that would offset reduction in suitable habitat. There are also large amounts of suitable habitat at all levels of FS and non-FS lands that do not receive treatment and are available.

Design Features:

Forest plan standards and guidelines (USDA Forest Service, 2004a) p. 2-14) for reserve tree management would provide conifer snags for the black-backed woodpecker. In all conifer-thinning activities, single trees and inclusions of poor-quality conifer would be maintained as well as additional healthy trees to provide for future habitat.

West Virginia White Butterfly (*Pieris virginiensis*)

West Virginia White butterflies (WVW) are a small all white butterfly with underside hind wings with veins colored a diffuse gray brown. They look very similar to mustard white butterflies, (*Pieris napi)*, but their underside has dark veins and there is a trace of yellow to the ground color. These two species are very difficult to separate, and location must be considered (Finnell, A.S. and C.A. Lehn, 2007). The range of West Virginia white butterflies includes Northern Wisconsin, upper and lower Michigan and Illinois, and from New England southwest along the Appalachians to north Georgia and northeast Alabama. Little is known of the historic distribution of the West Virginia white butterfly in Wisconsin. Records of West Virginia white butterflies are confirmed in eight counties of Wisconsin, including Vilas, Oneida, Forest, Florence and Langlade (Reese, 2016).

WVW utilize rich, mesic, closed canopy, deciduous forests or mixed deciduous-conifer forests, dominated by sugar maple and basswoods. Toothwort (*Cardamine sp.*), host plant for West Virginia white caterpillars, must be present in the understory (Reese, 2016). West Virginia white butterflies will move rather freely within forests and do stray from food plants. Flower nectar from toothwort, spring beauty, and violets are consumed by adults (Opler, P. A., H. Pavulaan, R. E. Stanford and M. Pogue, 2016).

This species spends most of the year as pupae. Adults fly in early spring, generally as the canopy closes with leaves, then following reproduction and egg-laying they die by about mid-June. Larvae must complete development before the host plant senesces, again, generally by mid-June. Chrysalids hibernate on stems of host plants or in plant litter beneath the plant. (Scott, J.A., 1986)

Limiting factors:

- Loss of the host plant. The host plant, toothwort, could be directly impacted by logging activities if equipment tramples or compacts the soil or otherwise disturbs the plant or butterfly larvae. Host plants may also be impacted by loss of canopy closure since the provided shade keeps soils moist, and thus favorable for toothwort.
- Introduction of vegetation competing with the host plant, especially aggressive non-native invasive plants such as garlic mustard (*Alliaria petiolata*). Garlic mustard also causes direct mortality to West Virginia whites because it is sometimes accepted by ovipositing females despite the fact that it poisons the developing larvae.

- Unfavorable weather. The West Virginia white flight period is early spring, primarily during May and early June. A late-arriving spring (cool/wet) can impact populations of the butterfly if it begins flying before toothwort emerges. Early flying individuals may have difficulty mating and laying eggs if the host plant is not yet above ground (Davis S. L. and D. Cipollini, 2013).

Measures

Suitable habitat on the CNNF is defined as closed canopy forests of northern hardwoods (FS Veg codes 81-89) and hardwoods with hemlock (type 20), that is at least 50 years old or uneven-aged. Aspen (FS Veg types 91 and 93) is also considered suitable if at least 60 years old. Closed canopied deciduous forests, or mixed deciduous-conifer forests, dominated by sugar maple and basswood occur in the project area.

Surveys

The host plant toothwort has been observed historically on the ER/FL RD and there are known records in Forest and Oneida counties. NHI data had no observations of toothwort (or WVW) on any landbase in the project area. There are also no historic locations in the project area and no new locations were found during the 2018 plant survey season. Surveys for toothwort were completed in 918 acers of suitable habitat with harvest treatments and there was 233 acres with winter harvest only mitigation measures and as a result to surveys were needed. If the species are present in those winter only stands, they will not impact due to the plants are dormant and chrysalids are in hibernation below the snow. However, we will be surveying an additional 195 acres of habitat prior to implementation of any harvest treatments to ensure no toothwort plants are present in the stand.

Boundary and Scale of Effects Analysis

Multiple spatial scales were used to evaluate meaningful effects to WVW. For evaluating direct and indirect effects, the project area was used. To analyze cumulative effects, only the Nicolet land base of the CNNF was used. Although the species is known from both the Chequamegon and Nicolet land bases, most of the records (93%) are from the Nicolet land base (USDA Forest Service, 2004a), p. J-116). The butterfly does not have strong dispersal abilities as they will not travel great distances (greater than 0.5 mile) to forage or mate. They also avoid crossing large open areas (anecdotally) which may effectively isolate populations, particularly in fragmented forest landscapes. Because of its limited ability to move about and the low number of occurrences on the Chequamegon land base, it is very unlikely that there are any interactions between populations of the species within the two land bases. However, acres of available suitable habitat on the CNF will be presented for discussion purposes only.

Cumulative effects analysis includes past actions, ongoing and those that are reasonably foreseeable. Silvicultural treatments that occurred in the past are manifest in the current conditions reflected in the corporate databases and beyond five years ago, the effects to WVW habitat are undetectable in northern hardwoods forest types because within five years canopy gaps created during selection harvest have closed considerably. Activities such as even-aged harvest have long lasting effects because they take habitat that may be (or may have been) suitable for the species and make it unsuitable for approximately 50 years. These actions will be considered for each of the spatial scales described above.

Threshold of Effects

In the species viability evaluation process for the Forest Plan revision, no minimum numbers of WVW's or its habitat (northern hardwoods) were identified for the maintenance of viability of the species (USDA Forest Service, 2002). Alternatives 3, 4, 5, 7, and 9 were all given the same ecological judgment (Outcome C) for the CNNF; this judgment was based largely on the amount of MA 2 (especially 2B) allocations (USDA Forest Service, 2002). Logically, the selected alternative would have the same outcome because it falls within the range of these alternatives in its MA 2 (especially 2B) allocations (USDA Forest Service, 2004a), Figure 3-21). The cumulative effects analysis for this project will determine if the effects of this project alter the trajectory of the amount of northern hardwoods types on the CNNF such that this total is heading outside the range of the Outcome C Forest Plan alternatives. If the cumulative effects of this and other projects remain within the range of cumulative effects analyzed in the Forest Plan revision process, then a threshold will not have been crossed and management direction as it relates to the species will not demand reevaluation. The revision alternative with a species viability evaluation Outcome of C, but the lowest projected total of hardwoods, was Alternative 5 (451,100 acres Forest-wide after 10 years). There are approximately 447,000 acres of northern hardwood (interior) forest on the CNNF (USDA Forest Service, 2004a) p. 3-155.

Determination of Effects:

National Forest system lands within the project area were evaluated for direct and indirect effects of alternatives to West Virginia white butterflies and their habitat.

Alternative 1 - *No Action*

Direct and Indirect Effects:

There would be no direct, indirect, or cumulative effects to WVW butterflies or their habitat. The no-action alternative would not result in any changes to existing habitat conditions for toothwort populations (*Cardamine* sp.) or West Virginia white butterflies if they occur within the project area.

Cumulative Effects (Alt. 1):

Although no direct or indirect effects to WVW are expected, within the Fourmile project area as well as Forest wide, there is a trend toward increasing the representation of longer lived species and maintenance or restoration of northern hardwoods ecosystems at multiple scales (USDA Forest Service, 2004a); pages 3-93 to 3-109). Consequently, selection of the No Action Alternative would passively contribute toward the general direction for portions of the Fourmile project area by allowing about 5,344 ac. of northern hardwood in the project area to continue to develop and maintain or increase canopy closure which are important features of WVW habitat.

Determination:

No impact**.** There would be no vegetation management under this alternative; therefore, there would be no additional effects on WVW habitat. Lack of management would result in passive maintenance of existing suitable habitat within the project area.

Alternatives 2 - *Action Alternative*

Direct and Indirect Effects:

There are no records of WVW or toothwort within the project area. As a result, there would be no direct impacts to the butterfly from the action alternative. If any new species locations are located in the future, winter only harvest mitigation measures would be implemented (USDA Forest Service, 2004a).

Within the project area there is 5,344 acres of suitable habitat for WVW's with 1,920 ac. of proposed treatments. If these harvest treatments are implemented in 2023, this suitable habitat would be reduced by 5.6% (Table 25). This reduction would occur from selection cuts in upland hardwood stands that are <10 in. DBH (327 ac.) and as a result will be unsuitable for 5 years. However, most harvest treatments would occur in upland hardwood forest types (1,503 ac.) were habitat would be maintained. This is due to treatments are either selections or improvement cuts that would maintain canopy closure at 80 % or greater immediately after harvest and thus suitable habitat would remain. In 2028, five years after implementation there would be an increase of 1.3% in suitable habitat. This increase is from hardwood stands returning to suitable habitat from treatments that initially reduced the canopy closure below 80% for five years.

Table 25. WVW habitat at the scale of the Fourmile project, ER/FL, and Nicolet landbase. For the 2023 and 2028 projections, the effects of all other projects within the analysis area are included.

Project Area	Alt. 1		Alt. 2	
Current Condition (2018)	5,344		5,344	
Following Implementation (2023)	5,372	0.53%	5,045	-5.59%
Five years after Implementation (2028)	5,415	1.32%	5,415	1.32%
Eagle River - Florence Ranger District	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	97,312		97,312	
Following Implementation (2023)	97,215	-0.10%	96,888	-0.44%
Five years after Implementation (2028)	98,834	1.56%	98,834	1.56%
Nicolet National Forest	**Alt. 1**		**Alt. 2**	
Current Condition (2018)	169,184		169,184	
Following Implementation (2023)	168,730	-0.27%	168,403	-0.46%
Five years after Implementation (2028)	177,868	5.13%	177,868	5.13%

Road management within West Virginia's butterfly's habitat with the action alternatives would result in the following: 20.8 miles of decommissioned roads, 1.2 miles reconstruction and remain open, 5.9 miles reconstruction than close, 0 miles new construction than close and 7.0 miles of roads converted to trail.

A threat to WVW and toothwort related to roads includes weed infestation, and in particular, garlic mustard. There is one known occurrences of garlic mustard in the project area near Butternut Lake. Garlic mustard can be detrimental because adult WVW confuse this plant with toothwort and will lay eggs on it. Any eggs deposited on the mustard plant result in death to larva once they begin feeding because of a poisonous substance in the leaves. Weeds (primarily seeds) are commonly spread by vehicles such as road maintenance equipment, logging vehicles, passenger cars and trucks, and ATVs.

A preventative measure in place on the CNNF to stop the spread of garlic mustard is equipment cleaning provision for all timber harvesting activities. As a result of these management requirements, no impacts to the butterfly or its host plant are expected from garlic mustard. The risk and spread of noxious weeds into any butterfly habitat within the project area would also be reduced by decommissioning 20.8 miles of roads in the project area.

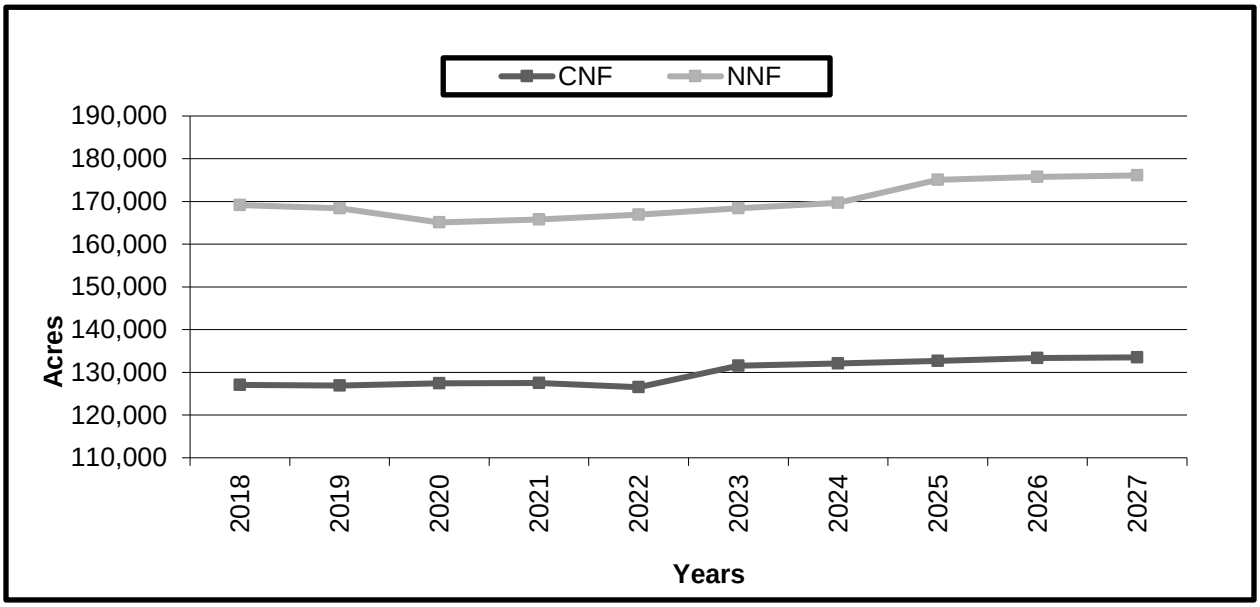
Prescribed fire and wildlife opening maintenance work will not occur in suitable habitat for WVW and thus there will be no negative affects to this species from those activities.

Cumulative Effect*:*

In 2023, after implementation the District and NNF levels of suitable habitat would decrease by 0.4%. This is primarily from implementation of harvest treatments in the Phelps, NW Howell and Morgan Lake projects. However, by 2028, the District and NNF levels would increase in suitable habitat from the 2023 amount by 1.6% and 5.1% (Table 25). These increases are primarily from ingrowth of aspen stands maturing and becoming suitable habitat on the ER/FL RD (2,310 ac) and LK/LA RD (4,000 ac.)

The abundance of hardwood forest which is typically maintained near 80 -100% canopy closure provides long-term stability of habitat favored by *Cardamine* sp. and thus by the WVW. If there are some unknown small pockets of toothwort and they are impacted by harvest treatments, it would not affect the overall population due to an abundance of toothwort habitat in the project area and across the NNF. Where habitat decline does occur in the mature aspen forest types the canopy will deteriorate possibly toward unsuitability eventually even if left untreated by harvest. Maintaining the aspen type, while potentially detrimental to *Cardamine sp.*, or the WVW does allow the forest to meet other objectives of providing essential plant and animal habitat diversity

Figure 15. WVW habitat trends for each Chequamegon and Nicolet Landbases 2018-2027.



There are approximately 8,500 acres that may be suitable WVW habitat on non-FS lands that are within and adjacent to the Fourmile project area (Table 4 and Table 5).

In the past there was 233 ac. of aspen habitat being clearcut along with 450 ac. upland hardwoods stands having selection cuts and 110 ac. In the future there will be 253 ac. of aspen management (22 ac. thinning and 231 ac. clearcut). Also, there will be about 1,119 ac. of selection and 25 ac. thinning cuts in upland hardwood stands were the habitat would remain suitable due to canopy closure remaining above 80%. Assuming that the age structure of the northern hardwoods forested acres are similar to the hardwoods on Forest Service land, most of those acres are suitable now. If the aspen age structure is similar to that on the Forest Service's land, there may be more aspen that will be clearcut and regenerated then reported in the upcoming five to ten years. Therefore, it is reasonable that only the northern hardwoods, (4,505 acres) are likely to support WVW habitat beyond the next decade. Based on the abundance of suitable hardwood habitat, implementation of these management plans on non-FS lands is unlikely to have a detrimental effect on this species. However, there are no records of WVW utilizing these non-FS lands.

In summary, direct effects to the species on FS lands would be avoided through temporal restrictions on most of the timber harvest of the hardwood treatments. Effects to other suitable habitat due to clearcutting, removal or shelterwood harvests of aspen stands would result in a short-term loss of a portion of the suitable habitat. But these losses are not contributing to a loss of habitat at larger scales because of short term effects and ingrowth of suitable habitat that occurs over time. Finally, as indicated by estimates of habitat availability on non-federal lands, suitable habitat appears abundant.

Determination:

No impact. WVW and toothwort are not known from the project area specific to stands proposed for treatment, but it has been observed at various locations across the ER/FL RD. Reductions in the amount of available habitat would result from implementation of the action alternatives but such losses are offset by short term effects (5 years) and gains in available habitat at the scale of the ER/FL RD. Impacts would also minimized because some harvests would occur only during winter. Also, harvest activity would occur over a period of years, and therefore not all habitats would be treated at one time.

Bats - Little Brown Bat, Tri-colored Bat, Big Brown Bat

The little brown bat, big brown bat, and tri-colored bat (or eastern pipistrelle) are listed as CNNF RFSS due primarily to concerns over WNS and not because of current scarcity or viability concerns on the Forest. The three RFSS bats have been included as a measure due to their vulnerability to WNS. As of the winter of 2015, WNS has been documented in Wisconsin as well as neighboring states Minnesota and Michigan (Figure 5). Our forest plan standards and guidelines do not mention bats specifically but lend themselves to providing and protecting those habitat characteristics which bats favors and require during the period of time in which they utilize the CNNF the most.

Assumptions:

1. The CNNF does not contain any known bat hibernacula. The primary focus is for protecting and providing adequate roost sites, and foraging locations not only during the summer months, but also during the spring and fall migratory periods.

2. By following the goals/objectives and standards/guidelines outlined in the forest plan we will contribute to a species-rich, diverse, robust, and healthy forest system that can provide for a wide range of wildlife and plant species needs, including those of the RFSS bats.

3. Bats will continue to be of increasing interest and concern on the CNNF, and across the country, into the foreseeable future. By incorporating them into our management strategy and future planning, the Forest will continue to be advocates for bat conservation and will be better able to provide proactive and innovative responses to threats such as WNS.

4. RFSS bats share many of the same requirements, and unless specifically stated here or in following sections, the three species will be analyzed together for effects of proposed project actions. In fact, the habitat requirements for these RFSS bats as provided by the CNNF are so similar, and the existing understanding of these requirements for the individual bats is such that it would be difficult to choose specific differences significant enough to require analysis at the individual species level.

5. In relation to the above assumption, the northern long-eared bat can be considered to have habitat requirements similar enough to RFSS bats that the analysis provided above for the NLEB would be identical to that which would be performed for the three RFSS bats included here. Thus, except where differences may exist and need to be discussed, the analysis for the NLEB will be used for RFSS bats.

Table 26. Regional Forester Sensitive Species - Bats

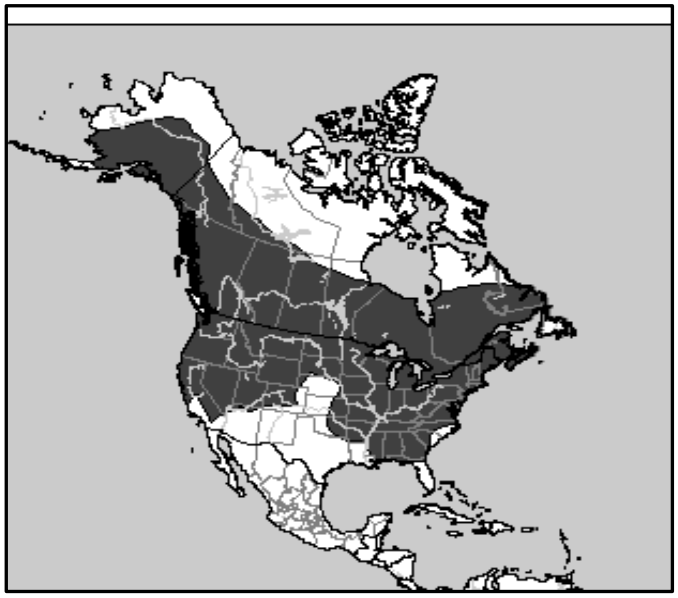
Species	Required Habitat	Known Occurrences	Suitable Habitat Present?
Little Brown Bat, Big Brown Bat	Roosting: caves/mines in winter; in buildings, bat houses, trees with loose bark in spring, summer, and fall. Foraging: in forested areas over water, along margins of lakes and streams.	Forest-wide	Yes
Tri-colored bat	Roosting: caves/mines in winter; in dead leaf clusters in tree foliage, especially oaks, and sometimes in buildings in spring, summer, and fall. Foraging: along forested streams and forest edges, in both uplands and bottomlands.	Forest-wide	Yes

Bat Species Specific Life History

Little Brown Bat (*Myotis lucifugus*)

The little brown bat is often the most abundant bat in the forested areas of the northern half of North America, especially near water. It ranges from Alaska to Labrador and Newfoundland (Canada), south to southern California, northern Arizona, and northern New Mexico (Fig.14). In the west it is found mainly in mountainous and riparian areas in a wide variety of forest habitats; from tree-lined xeric-scrub to aspen meadows and Pacific Northwest coniferous rain forests (BCI, 2001).

Figure 16. Approximate distribution of the Little Brown Bat (Nature Serve, 2016d)



In 1912, densities of approximately 200 per acre were estimated along the Mississippi River bottoms in Wisconsin. Little brown bats can be found roosting in warm sites provided by tree snags, bat houses and other manmade structures during the summer. During the winter, little brown bats can be found hibernating in caves and mines. The little brown bat is a Threatened species in Wisconsin, and is a Regional Forester Sensitive Species for the CNNF. Little brown bats have been documented on all five Ranger Districts on the Chequamegon-Nicolet National Forest which include Ashland, Bayfield, Florence, Forest, Oconto, Price, and Taylor counties.

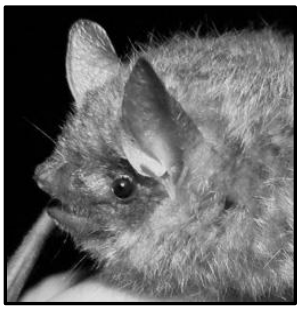
Big Brown Bat (*Eptesicus fuscus*)

The big brown bat is one of the most widespread and abundant bats in North America. (Fig. 14).

In Wisconsin, big browns are common and widespread; generally more common in the southern part of the state than in the north (WDNR, 2017b). Big brown bats are found in various habitats including mixed landscapes of deciduous woodlands, farmlands, edges near water and urban areas. In the summer months, females may form large colonies in bat houses and other manmade structures. During the winter, big brown bats can be found hibernating in natural structures such as caves and deep rock crevices, as well as manmade structures such as mines and human dwellings. The big brown bat is a Threatened species in Wisconsin and is a Regional Forester Sensitive Species for the CNNF. To date, big brown bats have been documented on all five Ranger Districts on the Chequamegon-Nicolet National Forest which include Ashland, Bayfield, Florence, Forest, Oconto, Price, and Taylor counties.

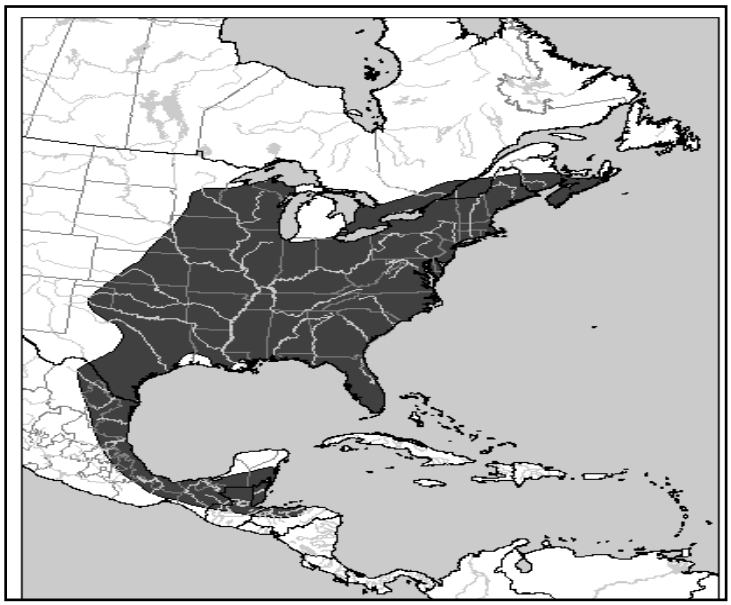
Figure 17 Approximate North American distribution of the Big brown bat **(Nature Serve, 2016e)**.

Tri-colored Bat (*Perimyotis subflavus*)



The tri-colored bat (f*ormerly known as the Eastern pipistrelle (Pipistrellus subflavus)* is solitary except for small nursery groups. It is listed as rare to uncommon in Wisconsin with documented occurrences in Crawford, Grant, Iowa, Lafayette, Pierce, Richland, and Vernon Counties (Thompson, 2006). They are at the northern edge of their range in Wisconsin and appear to be more common in the SW portion of the State. Tri-colored bats typically hibernate singly or in small groups within caves or mines. During the summer, they have been found roosting in trees and tree foliage, but little is truly known about their daytime and summer roosting preferences. Tri-colored bats are a Threatened species in Wisconsin and is a Regional Forester Sensitive Species for the CNNF. This bat has not been confirmed on the CNNF, but is consistently found in several mines in the Upper Peninsula of Michigan in small numbers within migrating distance of the Nicolet (East) side of the Forest. They are at the northern edge of their range in Wisconsin and appear to be more common in the southwest portion or western half of the state (WDNR, 2017b)

Figure 18. Approximate North American distribution of the Tri-colored bat (Nature Serve, 2016e).



Summer Roosting and Foraging: The roosting and foraging habits of the little brown bat appear to be more adaptable than those of other species and may explain why their range and occurrence is much more widespread. During the summer months, females will form maternity colonies of a few or even thousands of bats. It is unknown however where most males and non-reproductive females spend the summer, but they are typically more nomadic selecting a wide variety of cooler roosts, alone or in small groups. The little brown bat is especially associated with humans, readily found roosting in buildings, attics, bat houses and other man-made structures such as bridge crevices. They are also found in forested landscapes roosting in tree hollows, crevices, and beneath loose bark. They seem to prefer to forage over water, but will also forage among trees in open areas, forest borders, trails, cliff faces, meadows, farmland, and in nearly every kind of forest, from ground and sub-canopy to canopy (BCI, 2001). Since the summer habitat utilized by this species is widespread and abundant in Eastern North America, the primary risk to habitat is likely to involve the availability and suitability of winter habitat and pesticide exposure in summer habitat. Although the little brown bat is one of the most widespread and abundant bats in the east, its population status and trends are poorly monitored (BCI, 2001). No population or trend data is currently available for the Forest.

Big brown bats seem to be present in a wide variety of habitats, and are most abundant in farmland, urban areas, and edge habitat near water (WDNR, 2017b). Summer roosts can occur in crevices and holes of trees or snags or dead-top live trees, caves, and the attics and walls of buildings (WDNR, 2017b). Reproductive females form maternity colonies in buildings, bat houses, tree cavities, and rarely, rock crevices. Big brown bats seem to be generalists in their choice of foraging habitat (BCI, 2001). Foraging occurs in forest gaps and riparian areas. Big brown bats seem to prefer to forage in urban landscapes along forest and field edges, over open water and along shorelines (WDNR, 2017b). The WDNR states that more information is needed to more fully understand big brown bat foraging habitats and summer roosting in Wisconsin. No population or trend data is currently available for the Forest.

Little is known about tri-colored bat summer roosting and feeding habitat requirements. Initial information concerning summer habitat indicates use of deciduous forest trees in landscapes that include interspersed non-forested patches. Males will typically stay solitary while females congregate into small, 35 individual or less, maternity colonies in tree cavities, and rock crevices. They are rarely found in buildings or in deep woods, seeming to prefer edge habitats. The general landscapes used by tri-colored bats include partly open country with large trees and woodland edges (Amelon, S. and K. Womack, 2012). Foraging typically occurs along forest edges, over ponds, and waterways (BCI, 2001), but also occurs along edges between intact forests and cut areas, but rarely in the middle of large regenerating stands. Since roosting and foraging habitat is widespread and abundant in Eastern North America, the primary risk to habitat may involve availability and suitability of winter habitat or pesticide exposure in summer habitat (Thompson, 2006). Better knowledge of summer habitat requirements and the impact of management activities on this

habitat is a prerequisite to further management guidelines (BCI, 2001). No population or trend data is currently available for the Forest.

In the fall, the RFSS bats perform short annual migrations between their summer/maternity roost sites and their winter hibernation site. As with other forest bat species, more is typically known about winter hibernation habitats and behavior than is known about the species summer requirements.

Threats and Limiting Factors

As covered in more depth in the analysis section pertaining to the northern long-eared bat, no other threat is as severe and immediate as that of the disease WNS. If this disease had not emerged, it is unlikely that these RFSS bats, or the northern long-eared bat, would be experiencing such a dramatic population decline (USDI (2016f). Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest, west and southeast; an area that includes much of the range for these three bat species. Based on white-nose syndrome surveillance, and winter roost monitoring, all three RFSS bats have been shown to be effected by WNS. Depending on the species, its specific winter roosting behavior and other factors, the effects of WNS may be different between species. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, it is expected to spread throughout the United States in the foreseeable future.

Other potential sources of mortality can include: impacts to hibernacula, loss or degradation of summer habitat, and food chain poisoning (i.e., poisoning of bat's food and/or bats themselves). Although significant RFSS bat population declines have only been documented due to the spread of WNS, other sources of mortality, such as those described here, could further diminish the species' ability to persist as it experiences ongoing dramatic declines. Specifically, declines due to WNS have significantly reduced the number and size of bat populations in some areas of its range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual bats are sickened or struggling with infection by WNS may be less able to survive other stressors. Second, bat populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less able to recover making them more prone to extirpation. The status and potential for these impacts will vary across the range of the species.

Over the long-term, sustainable forestry benefits many bat species by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on RFSS bats depending on the quality, amount, and location of the lost habitat, and the time of year of the activity. Depending on their characteristics and location, forested areas can function as summer maternity habitat, staging and swarming habitat, migration or foraging habitat, or sometimes, combinations of more than one habitat type. Impacts from tree removal to individuals or colonies would be expected to range from indirect impact (e.g., minor amounts of forest removal in areas outside RFSS bat summer home ranges or away from hibernacula) to minor (e.g., largely forested areas, areas with robust RFSS bat populations) to significant (e.g., removal of a large percentage of summer home range, highly fragmented landscapes, areas with WNS impacts).

It should be repeated that on the CNNF, no bat-accessible mine openings, caves, or other structures that could be used for fall swarming or winter hibernation habitats are known to exist. Thus, the spread of WNS and disturbance of winter hibernacula is not an issue. Forest management actions that could be considered threats to the bats are associated with disturbance of summer roosting and foraging habitat.

Monitoring and Surveys

See Monitoring and Survey for NLEB under the federally listed species section for details on monitoring and surveys. Surveys resulted in 8 big brown, 25 little brown and 0 tri-colored bats being detected in the project area.

Analysis of Effects

There is enough similarity in the type of roosting and foraging habitat among the four bats (including the northern long-eared bat) species to analyze them together at the project scale. While there are some species specific differences in use of summer roosting and foraging habitat between the little brown, big brown, tri-colored, and northern long-eared bats, we do not have adequate information to analyze these individual differences at the project scale.

Therefore, the analysis for the little brown, big brown, and tri-colored bat is the same as that presented under the northern long-eared bat (NLEB) section under the federally listed species. All assumptions, direct, indirect impacts along with the cumulative impacts for the NLEB are applied to the little brown, big brown, and tri-colored bats.

All forest plan standards and guidelines and the Fourmile project design features described in the NLEB section above also apply to RFSS bats. Additionally, mitigations and protections provided by the FS Eastern Region Conservation Measures specific to NLEB would also provide some benefit to RFSS bats.

Determination of Effects to RFSS Bats

Alternative 1 - No Action

Determination: *No Impact.*

Alternative 2 - Proposed Action

Determination: May impact individuals, but not likely to cause a trend Federal listing or loss of viabil*ity.*

Regional Forester Sensitive Species - Plant

Executive Summary

This report analyzes how the proposed Fourmile Vegetation Management Project would affect RFSS plants. All RFSS plants were initially considered for this analysis, however detailed analysis were conducted for species confirmed or likely to occur in the project area and where there is potential to be impacted by the proposed action. Species analyzed in this report include Mingan moonwort (*Botrychium minganense*), little goblin moonwort (*B. mormo*), bluntlobe grapefern (*B. oneidense*), ternate grapefern (*B. rugulosum*), spreading woodfern (*Dryopteris expansa*), butternut (*Juglans cinerea*) and American ginseng (*Panax quinquefolius*).

Analyses differentiate between occupied habitat (direct effect) and unoccupied habitat (indirect effect). Direct effects occur to individual plants or when occupied habitat is made unsuitable. An indirect effect occurs when suitable habitat is made unsuitable. The analysis area for direct and indirect effects is the Fourmile project area. Cumulative effects are the impacts that result from the incremental impact of the proposed action when added to past, present, or reasonably foreseeable future actions. Cumulative effects are evaluated at hierarchical scales from the Fourmile project area up to the ER/FL RD and up to the Nicolet land base. The Forest Service developed habitat models based on habitat characteristics and conservation assessments to analyze impacts to RFSS plants. Effects on habitat suitability vary depending on the proposed treatment and resulting effects to canopy closure.

There are no known occurrences of Mingan moonwort in the project area, therefore no direct effects. Occurrences of Mingan moonwort are probable within the project area. A short-term reduction in suitable unoccupied habitat occurs at all scales that dissipates within five years. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions.

There are two occurrences of little goblin moonwort in the project area; one occurrence is adjacent to a stand proposed for treatment. Direct effects too little goblin moonwort would be minimized due to design features therefore no direct effects. A short-term reduction in suitable unoccupied habitat occurs but dissipates within five years. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions.

There are two occurrences of bluntlobe grapefern in the project area, one in a stand proposed for treatment. There are no direct effects to bluntlobe grapefern due to design features. A short-term reduction in suitable unoccupied habitat occurs but dissipates within five years. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions.

There is one occurrence of ternate grapefern in the project area adjacent to a stand proposed for treatment. Direct effects to the ternate grapefern and occupied habitat would be minimized due to the design features therefore no direct or indirect effects.

There is one spreading woodfern in the project area in one stand that is not proposed for treatment. No project activities proposed within occupied habitat or suitable unoccupied habitat therefore no direct or indirect effect.

There are no known occurrences of butternut in the project area, therefore no direct effects. Occurrences of butternut are probable within the project area. During implementation, Forest Plan guidelines will be followed protecting undiscovered trees and suitable unoccupied habitat, therefore no indirect effects.

There are 18 American ginseng occurrences in the project area occurring in 11 stands, of which six are proposed for treatment. Although design features will be followed, there is a short-term direct impact to occupied habitat that dissipates within five years. A short-term reduction in suitable unoccupied habitat occurs but dissipates within five years. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions.

Introduction

The plant analysis required a number of different approaches then those used in the animal analysis. As a result, there are separate Introduction, Boundary and Scales of Effects Analysis, Threshold of Effects, Methods, and Determination of Effects sections for the plants. These sections will not be presented with each individual plant species but once as this information represents all the plants analyzed.

The pre-European settlement distribution of understory plants associated with the northern hardwoods ecosystem of the Great Lakes area, such as moonwort and grapefern species (*Botrychium* spp.), spreading woodfern (*Dryopteris expansa*) and American ginseng (*Panax quinquefolius*) is unknown. However, their habitat affinity is known and the distribution of their preferred habitat has been approximated based on reconstructions of the pre-settlement vegetation cover from the General Public Land Survey records (Schulte **(2002)**. Based on such assessments, northern hardwood forests of shade-tolerant tree species such as sugar maple (*Acer saccharum*), American basswood (*Tilia americana*), yellow birch (*Betula alleghaniensis*), American elm (*Ulmus americana*), and eastern hemlock (*Tsuga canadesis*) were more abundant prior to the logging era of the early twentieth century. Forest types dominated by these long-lived, shade-tolerant tree species have slowly increased since, as they replace stands dominated by early-successional species, such as paper birch (*Betula papyrifera*) and quaking (*Populus tremuloides)* and bigtooth aspen (*P.grandidentata*), that colonized cleared areas following the logging era. Northern hardwood forests of long-lived, shade-tolerant tree species that typify rare plant habitats are still in the process of returning to the uneven-aged conditions with multiple overstory tree species that existed prior to the logging era. Some understory flora associated with these forest types have been slow to recover from the logging era and have been documented in other past agriculture and reforestation studies (Flinn, K.M. and M. Vellend, 2005).The CNNF generally manages forest types dominated with these tree species to promote uneven-aged conditions and maintains closed canopy conditions.

Rare plant species inventory on the Nicolet land base formally began in the early 1980's with a contract for a rare plant inventory through the WDNR. There was very limited additional formal inventory of plants, rare or otherwise, until 1994. Since then, the Forest has cataloged 48 rare plant species and two lichen species currently listed as RFSS, occurring in over 2,000 sites. The CNNF now actively inventories for rare plants on all suitable lands with planned management activities.

Measures

Analyses differentiate between currently occupied habitat (direct effect) and unoccupied habitat (indirect effect). Occupied habitat is defined as a stand with an occurrence of a RFSS plant. The entire stand is considered as occupied even if a RFSS plant is only found in one area of the stand. Furthermore, occupied habitat has been differentiated into occupied suitable habitat (stands with typical forest types) and occupied other habitat (stands with atypical forest types, but suitable soils).

Suitable habitat is defined for individual species under Habitat Models below. In general, suitable habitat considers location and range of previously known sites, soils, habitat types, and overstory canopy cover types of these sites. Information on species habitat and location from Conservation Assessments, information from researchers, known sites on the forest, and the Wisconsin State Herbarium (WIS) is also considered.

A direct effect occurs when individual plants are trampled during harvest operations, or when occupied habitat is made unsuitable by management. An indirect effect occurs when actions making otherwise suitable unoccupied habitat, unsuitable. Cumulative effects are the impacts on the environment that result from the incremental impact of the action when added to past, present, or reasonably foreseeable future actions.

Boundary and Scale of Effects Analyses

Due to their limited pollen and seed dispersal abilities, RFSS plant populations are not likely to interact between land bases (Nicolet and Chequamegon) of the CNNF, or even between ranger districts of the same land base. Therefore, the project area is the analysis boundary for direct and indirect effects.

Despite the limited geographic scale over which effects to these species may meaningfully accumulate, cumulative impacts to habitat availability are evaluated at hierarchical scales from the project area up to the ER/FL RD and up to the Nicolet land base of the CNNF. Past, present, and reasonably foreseeable projects within suitable habitat at these spatial scales will be included within this analysis area.

Alternatives are compared on the amount of suitable habitat that currently exists, what would exist immediately following the treatment, and what would exist after five years. Alternatives are also compared by the amount of miles of road built, reconstructed, and decommissioned in the project area. These totals will be combined with the past (up to five years), present and reasonably foreseeable transportation activities at the spatial scales described above.

RFSS plant occurrences are not known to occur on adjacent non National Forest System (NFS) lands within the Fourmile project area. However, additional potential habitat for RFSS plants does occur on non NFS lands. Of the 11,206 acres of non NFS lands within the Fourmile project area, 2,157 acres are upland hardwoods with potential habitat for RFSS plants with a northern hardwood habitat affinity. Of that potential habitat, 131 acres are managed by the State of Wisconsin Board of Commissioners of Public Lands (WI BCPL) and 433 acres are enrolled in the Managed Forest Law (MFL) program. Assuming these lands are managed for uneven-aged conditions on a fifteen year rotation, 376 acres (66%) of these lands have closed canopy conditions favorable to RFSS plants with a northern hardwood habitat affinity. This calculation assumes the adjacent lands under other ownership are evenly distributed within the 15-year rotation cycle and treatments occurring on these lands result in a five year period of unsuitability. Given that no known occurrences of these species are known from adjacent lands under other ownership in the Fourmile project area, this habitat is assumed to contribute to the surplus of habitat in the area. Undiscovered plant locations on adjacent lands under other ownership managed for timber production are assumed to be unprotected by seasonal harvest restrictions or no-disturbance buffers.

Threshold of Effects

In the Species Viability Evaluation (SVE) process for the CNNF Land and Resource Management Plan (Forest Plan) revision, no minimum numbers of plants or plant patches for any species, or their habitat, were identified. Plan revision Alternatives 3-9 received outcome scores of D (which matches its judgment of the existing conditions in 2002 when the panel was convened) (USDA Forest Service, 2002). SVE panelists were not optimistic that these species would be able to spread to suitable unoccupied habitat or to new habitat created through conversion to hardwoods. Most RFSS plant species have very limited dispersal capabilities, (Chadde, S. and G. Kudray, 2001a) (Chadde, S. and G. Kudray, 2001b), (Chadde, S. and G. Kudray, 2003a), (Chadde, S. and G. Kudray, 2003b), (Kaufman, 2006) (Shultz, J., 2003) (USDA Forest Service, 2002), (USDA Forest Service, 2003). However, land fragmentation largely prevents populations from moving across districts and land bases. Limited dispersal abilities for the hardwoods-affinity group notwithstanding, the probability of successful colonization of these species is likely to be positively related to the connectivity of their habitat. This is likely to be particularly true for American ginseng and butternut, as the red fruits and nuts of American are known to be dispersed by song birds and rodents for American ginseng (Hruska, A.M., S. Souther, and J.B. McGraw., 2014)and butternut (Rink, 1990), respectively. There is no previously defined threshold from the Forest Plan revision process, Conservation Assessments, or the scientific literature. Through project management requirements that protect known RFSS plant patches (the area of the above ground portions of the plants) from detrimental effects, loss of existing patches due to land management activities is not expected to occur. However, should any loss of patches be the result of land management activities (such as timber harvesting) in this project, project management requirements for these plant species will be reevaluated.

Methods

Surveys

Botanists, Ecologists, or other qualified observers (technicians or contractors) designated by a Botanist or Ecologist surveyed potential suitable habitat within the Fourmile project area. Rare plant surveys specific to this project were conducted in 2010 (602 acres), 2017 (961 acres) and 2018 (5,344 acres); totaling 6,908 acres. The survey period was weather and phenologically dependent but was generally between mid-July and mid-September, when most of the target species are visible and identifiable. The primary survey method was the intuitive meander, where the surveyor concentrates efforts in areas most likely to harbor RFSS plants while still covering the full extent of stand(s).

Rare plant surveys are intended to identify habitat suitability and identify new plant populations. Some species are very inconspicuous and hard to find. It would be impractical to search every square foot of habitat for every species. Surveys are considered a sampling of a population. As a result, it is possible that undiscovered locations of RFSS plant species may be found in suitable habitat in the project area.

A pre-field review of the Fourmile project area was conducted prior to survey implementation to identify currently known rare plant locations and potential survey needs based on suitable habitat within stands, including those stands adjacent to suitable habitat, and possible effects from proposed actions. A Geographic Information System (GIS) computer analysis was used incorporating spatial information from previously known rare plant sites, soils, habitat types, and overstory cover types. This computer analysis, which is a coarse filter for identifying potential or suitable habitat, helps prioritize which stands may need on-the-ground surveys. Actual on the ground surveys may or may not agree with the suitability of habitat for rare plant species identified by the analysis. It should be noted that the computer analysis used to identify suitable habitat is dynamic and parameters used to define suitable habitat are refined as new information is gathered.

Habitat Models

The Forest Service developed habitat models to analyze the impacts to RFSS (USDA Forest Service, 2010), which were also used to determine stands with suitable habitat. These habitat models are based on known habitat characteristics and species conservation assessments capabilities (Chadde, S. and G. Kudray, 2001a) (Chadde, S. and G. Kudray, 2001b), (Chadde, S. and G. Kudray, 2003a), (Chadde, S. and G. Kudray, 2003b), (Kaufman, 2006) (Shultz, J., 2003), (USDA Forest Service, 2002), (USDA Forest Service, 2003). Suitable habitat for most RFSS plants with a northern hardwood habitat affinity is defined as northern hardwoods (FS VEG codes 81 to 89 with a size density code of 6 or 9) with closed canopy conditions. Suitable habitat for spreading woodfern is expanded to include mixed hemlock-northern hardwoods (FS VEG code 20). Stands of these forest types are considered to have closed canopy conditions unless they have been treated within the past five years. In five years or less, a hardwood stand that has been thinned to less than 80% canopy closure is assumed to have returned to favorable physical conditions (canopy closure, high humidity, and cool temperature) and is once again suitable. The minimum stand age for little goblin moonwort and bluntlobe grapefern is 70 years, 65 years for spreading woodfern and 50 years for Mingan moonwort and American ginseng (USDA Forest Service, 2010). Effects on habitat suitability vary depending on the proposed treatment (timber harvest). Individual tree selection harvests, including those with canopy gap creation as a secondary treatment, do not reduce the average canopy closure below 80%, so the habitat remains suitable immediately following. Thinning, improvement harvests, and individual tree selection harvests occurring within the Argonne Experimental Forest reduce canopy closure to around 75% which recovers to 80% in about five years. The habitat is considered unsuitable for five years following treatment; beyond five years, the effects of the treatment are assumed to be resolved (USDA Forest Service, 2010).The effects of even-aged treatments such as clearcut, shelterwood, and overstory removal harvests cause the habitat to become unsuitable for the long-term, lasting approximately 50 years (Metzger, F. and J. Shultz, 1984), (USDA Forest Service, 2010).

Actual on the ground timber sales and harvest activities in the Fourmile project area would be spread out over many years, so not all stands would be cut at the same time. However, for the purposes of the habitat models, to simplify making calculations and displaying results, it is assumed that all activities will occur in the year 2023. Short-term (≤ five years) effects are assumed to dissipate in 2028.

Soil Disturbance and Non-native Invasive Species

Practices associated with the proposed treatments not only include the harvesting treatment, but secondary treatments like site preparation and canopy caps and other related actions such as landings, skid trails, and

haul roads. These actions have the potential to alter the physical site conditions and disrupt the soil and existing vegetation, potentially affecting habitat suitability. The Forest soil scientist developed an estimate, based on current literature, CNNF reviews and reports, that 13% of the soil in each stand is disturbed from these forestry practices; this may be substantially less in stands treated with individual tree selection harvests. Mechanical site preparation (MSP) activities result in 50% to 70% soil disturbance within a stand; for the purpose of this analysis the average 63% will be used. Canopy gaps and aspen site preparation (ASP) activities are manual and are assumed to have no soil disturbance. If a stand has multiple proposed activities, the activity with the higher percentage of soil disturbance will be utilized. For example, if a stand has a proposed shelterwood cut, 13% soil disturbance, and mechanical site preparation, 63% soil disturbance, the total soil disturbance for the stand will be 63% of the stand area. The effect of soil disturbance has been considered in the determination of effects to RFSS plants, however soil disturbance is analyzed in greater detail in the Fourmile NNIS specialist report.

Proposed road activities will increase the risk of NNIS introduction and expansion by altering physical site conditions (increased light and soil exposure will create suitable habitat for invasion), by altering disturbance regimes (frequent disturbance associated with road traffic and maintenance will create a continuous opportunity for introduction and establishment), by disrupting existing vegetation (the reduced competitiveness of native species will promote establishment), and by increasing dispersal ability and probability of chance introductions (roads act as corridors for dispersal via animal and human vectors) (Hansen, M.J. and A.P. Clevenger, 2005) (Parendes, L.A. and J.A. Jones, 2000) (Trombulak, S.C. and C.A. Frissell, 2000) (Von Der Lippe, M. and I. Kowarik, 2007) (Watkins, R. Z., J. Chen, J. Pickens, and K.D. Brosofske, 2003). The spread of NNIS would be minimized through winter-only harvesting (Wolf et.al. (2008) washing vehicles and equipment, and harvesting uninfested stands before infested stands (see Fourmile NNIS Specialist Report).

Although non-native earthworms (*Dendrobaena* spp., *Eisenia* spp., and *Lumbricus* spp.), may have a profound negative effect on understory plants in northern hardwoods ecosystems by altering soil properties; reduce and eliminate the surface organic layer, altering composition and abundance of soil biota, altering and diminishing seed germination and seedling survival (Bohlen et.al (2004), (Gundale, M.J, 2002) (Hale, C.M, L.E. Frelich, and P.B. Reich, 2006) (Lawrence, B., M.C. Fisk, T.J. Fahey and E.R. Saurez, 2002). They are not expected to be spread by logging equipment at sites treated during frozen ground conditions and are not considered in the effects analysis of occupied stands. Timber harvesting activities in this project would be required to follow equipment cleaning regulations to minimize the spread of undesirable organisms, which includes worms.

The Fourmile project proposes to build 1.4 miles of new roads, of which 1.2 miles will be closed following implementation and 0.2 will be temporary. In addition, 147.2 miles of existing roads are proposed to be decommissioned reducing the net mileage of roads in the project area by 137.4 miles. The reduction in road mileage under Alternative 2 would reduce the spread of NNIS such as garlic mustard (*Alliaria petiolata*) and earthworms, which have the potential to have negative impacts on all RFSS plant populations and their respective habitat.

Species Considered

Detailed analyses were conducted for species which are confirmed to occur in the Fourmile project area or have a high likelihood of occurring within the project area based on habitat availability, proximity to documented occurrences and potential to be impacted by the proposed action(s) (see Table #). All RFSS plant species were initially considered for this analysis, but not evaluated in detail for a variety of reasons, including:

> Species known to occur in or within 0.25 mi of the analysis area, but suitable habitat is not actively managed; non-treatment habitats such as lowland conifer stands, streams, wetlands, etc.: roundleaf orchid (*Amerorchis rotundifolia*), fairy slipper (*Calypso bulbosa*) bright green spikerush (*Eleocharis olivacea*) American shoreweed (*Littorella uniflora*) and Tuckerman's pondweed (*Potamogeton confervoides*).
>
> Species with "minimal" occurrence potential; the likelihood of occurrence within the project area was determined to be very low following surveys: Canada ricegrass (*Piptatheropsis canadensis*).

Mingan Moonwort (Botrychium minganense)

Mingan Moonwort (*Botrychium minganense*) is small perennial fern with a single aboveground frond that is found throughout the western half of the United States and Great Lakes and New England regions of the eastern United States (Nature Serve, 2019a). In Wisconsin, it is scattered across the northern counties and occurs in mixed northern hardwood forest often dominated by sugar maple and basswood and open areas, such as sandy lake shores and old clearings. It is closely associated with other *Botrychium* species in an assemblage referred to as a "genus community." The optimal time to identify Mingan moonwort is early June through late July. Due to its small stature and periodic emergence it can easily be overlooked. Limiting factors for Mingan moonwort include changes in habitat (canopy closure, moisture regime, mycorrhizal fungi, organic matter, and soil characteristics) due to exotic earthworms, forestry practices, and road construction (Chadde, S. and G. Kudray, 2001a).

Mingan moonwort has been documented at nine sites in the CNNF; five (55.6%) sites are in the Nicolet land base, of which one (11.1%) site is in the ER/FL RD. There are no known sites in the Fourmile project area. The closest occurrence is approximately 11 miles to the northeast of the project area. The Fourmile project area contains suitable habitat and it's probable there are occurrences within the project area.

Table 27. Area (ac) of suitable unoccupied Mingan moonwort habitat in proposed treatment areas of the Fourmile project area by Alternative. S is habitat that is suitable following treatment, U-ST is habitat that is unsuitable, for the short-term (≤ five years) following treatment and U-LT is habitat that is unsuitable for the long-term (≥ 50 years) following treatment.

				Alt. 1		Alt. 2	
Habitat	**Effect**	**Primary**	**Secondary**	**Area (ac)**	**N**	**Area (ac)**	**N**
Unoccupied-Suitable	S	None	None	11634	348	6295	185
		Selection	Canopy Gaps	0	0	4560	136
		Sub-Total		11634	348	10855	321
	U-ST	Improvement	Burn	0	0	17	1
			None	0	0	176	6
		Selection	Argonne	0	0	526	16
		Thin	None	0	0	18	1
		Sub-Total		0	0	737	24
	U-LT	Clearcut/Coppice	MSP	0	0	37	2
		Removal	None	0	0	5	1
		Sub-Total		0	0	42	3

Alternative 1 - *No Action*

No treatment or connected actions would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effect.

Determination: *No impact due to no project activities.*

Alternative 2 – *Action Alternative*

Direct Effects

There are no occupied stands in the Fourmile project area proposed for treatment under Alternative 2, therefore no direct effects.

Indirect Effects

There are 11,634 acres of northern hardwood stands in the Fourmile project area considered suitable habitat, of which 5,339 are proposed for treatment in Alternative 2. As shown in Table 27. Alternative 2 proposes to treat 4,560 acres (39.2%) of suitable unoccupied habitat that would remain suitable after treatment, 737 acres (6.3%) of suitable unoccupied habitat would become unsuitable in the short-term (≤ five years) after treatment, and 42 acres (0.3%) of suitable unoccupied habitat would be become unsuitable for the long-term (≥ 50 years) after treatment. Based on the habitat models, the three stands that become unsuitable for the long- term (≥ 50 years) following treatment, are considered suitable habitat. However, the site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Table 28. Recommended operating season within Mingan moonwort and American ginseng habitat (ac) in the proposed treatments of Alternative 2 of the Fourmile project area. Mingan moonwort and American ginseng have similar habitat requirements and identical habitat models (FS VEG codes 81 to 89 with a size density code of 6 or 9 and a minimum stand age of 50).

Proposed Action		Year Round	Winter or Dry Summer-Fall	Winter Only				Total
Primary	Secondary			MA 2B	RFSS	Soils	Sub-Total	
Clearcut/ Coppice	MSP	37	0	0	0	0	0	37
Improvement	Burn	17	0	0	0	0	0	17
	None	40	36	26	0	74	100	176
Removal	None		0	5	0	0	5	5
Selection	Argonne	118	0	0	408	0	408	526
	Canopy Gaps	2,598	144	1,408	193	216	1,817	4,560
Thin	None	18	0	0	0	0	0	18
Total		2,829	180	1,440	601	290	2,330	5,339

As shown in Table 28 of the 5,339 acres of suitable unoccupied habitat proposed for treatment in Alternative 2, 2,330 acres (43.6%) would be restricted to frozen ground harvest for one the following reasons: 1) the presence of one or more RFSS plant species, 2) potential impacts to soil resources as determined by the Forest Soil Scientist, or 3) occurs in management area (MA) 2b, which restricts harvesting in northern hardwood stands to frozen-ground conditions only (USDA Forest Service, 2004a). Harvesting during frozen ground conditions minimizes soil disturbance and compaction (Kolka, R., A. Stebler, K. Brooks, C.H. Perry and M. Powers, 2012). Furthermore, winter logging may have fewer negative impacts than summer logging on vulnerable plant species and, in the long run, may help maintain plant biodiversity in managed forests (Wolf, A.T., L. Parker, G. Fewless, K. Corio, J. Sundance, R. Howe, and H. Gentry, 2008).

The remaining 3,009 acres of proposed treatments occurring in suitable unoccupied habitat in Alternative 2 do not restrict harvesting to frozen ground conditions. It is assumed stands with the winter or dry summer-fall seasonal operating restriction will be implemented during a dry summer-fall. Based on the 13% rate of soil disturbance caused by forestry practices estimated by the Forest Soil Scientist, there will be 391 acres of soil disturbance with in suitable unoccupied habitat in Alternative 2. These figures are likely inflated since soil disturbance in areas treated with individual tree selection harvests are assumed to be lessened, however an estimate has not yet been developed. There is an increased likelihood of NNIS introduction and spread in stands not harvested during frozen ground conditions due to altered physical site conditions, soil exposure, and disturbance regimes and reduced competition from native vegetation (Hansen, M.J. and A.P. Clevenger, 2005) (Parendes, L.A. and J.A. Jones, 2000) (Trombulak, S.C. and C.A. Frissell, 2000) (Von Der Lippe, M. and I. Kowarik, 2007). These factors could reduce habitat suitability in 56.4% of suitable stands not restricted to frozen ground harvest.

There would be a short-term (≤ five years) reduction (737 acres) in suitable unoccupied habitat in Alternative 2. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 43.6% of suitable unoccupied habitat would be

harvested during frozen ground conditions, reducing potential impacts from the inadvertent trampling of individual plants caused by mechanical disturbance in previously undocumented sites and from the impacts of NNIS. 56.4% of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance and the impacts of NNIS.

Cumulative Effects

Table 29. Area (ac) of occupied and suitable unoccupied Mingan moonwort habitat within the Fourmile project area, ER/FL RD and Nicolet land base. Associated percentage values are the percent change from the current (2018) condition; negative values indicate a loss of habitat. The effects of all other projects within the analysis area are included in the 2023 and 2028 projections.

Fourmile Project Area		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	11,634		11,634	
	Occupied	0		0	
	Total	11,634		11,634	
Immediately following treatment (2023)	Unoccupied	11,634	0.0%	10,855	-6.7%
	Occupied	0	0.0%	0	0.0%
	Total	11,634	0.0%	10,855	-6.7%
Five years after treatment (2028)	Unoccupied	11,634	0.0%	11,593	-0.4%
	Occupied	0	0.0%	0	0.0%
	Total	11,634	0.0%	11,593	-0.4%
Eagle River-Florence Ranger District		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	107,752		107,752	
	Occupied	63		63	
	Total	107,815		107,815	
Immediately following treatment (2023)	Unoccupied	108,517	0.7%	107,687	-0.1%
	Occupied	63	0.0%	63	0.0%
	Total	108,580	0.7%	107,750	-0.1%
Five years after treatment (2028)	Unoccupied	109,439	1.6%	109,397	1.5%
	Occupied	63	0.0%	63	0.0%
	Total	109,502	1.6%	109,460	1.5%
Nicolet Land Base		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	196,274		196,274	
	Occupied	1,117		1,117	
	Total	197,391		197,391	
Immediately following treatment (2023)	Unoccupied	195,459	-0.4%	194,629	-0.8%
	Occupied	1,117	0.0%	1,117	0.0%
	Total	196,575	-0.4%	195,746	-0.8%
Five years after treatment (2028)	Unoccupied	200,241	2.0%	200,200	2.0%
	Occupied	1,117	0.0%	1,117	0.0%
	Total	201,358	2.0%	201,317	2.0%

Occupied Habitat

Currently there are zero acres of occupied habitat within the Fourmile project area, 63 acres of occupied habitat in the ER/FL RD, and 1,117 acres of occupied habitat in the Nicolet land base. Immediately following project implementation in 2023 there is no change (0.0%) to occupied habitat at all scales, as occupied habitat remains at zero, 63, and 1,117 within the Fourmile project area, ER/FL RD, and Nicolet land base, respectively. Five years following project implementation in 2028 there is no change (0.0%) to occupied habitat at all scales, as occupied habitat remains at zero, 63, and 1,117 within the Fourmile project area, ER/FL RD, and Nicolet land base, respectively (see Table 29). Treatments do occur in occupied habitat as part of the NW Howell project (63 acres) in the ER/FL RD and part of the McCaslin project (1,054 acres) in the LK/LA RD on the Nicolet land base, however habitat remains suitable following treatment.

All Mingan moonwort occurrences in stands proposed for treatment in all project areas will be protected from mechanical disturbances and edge effects by a 250 foot no activity, no disturbance buffer. Additionally, all occupied stands in all project areas would be harvested during frozen ground conditions, to reduce potential impacts to undiscovered sites.

Unoccupied Habitat

Currently there are 11,634 acres of suitable unoccupied habitat in the Fourmile project area, 107,752 acres of suitable unoccupied habitat in the ER/FL RD, and 196,274 acres of suitable unoccupied habitat in the Nicolet land base. Immediately following project implementation in 2023, there is a 6.7% (779 acres) reduction of suitable unoccupied habitat in the Fourmile project area, a 0.1 % (65 acres) reduction of suitable unoccupied habitat in ER/FL RD, and a 0.8% (1,645 acres) reduction of suitable unoccupied habitat in the Nicolet land base. Five years following project implementation in 2028, there is a 0.4% (41 acres) reduction of suitable unoccupied habitat in the Fourmile project area, a 1.5% (1,645 acres) increase of suitable unoccupied habitat in ER/FL RD, and a 2.0% (3,926 acres) increase of suitable unoccupied habitat in the Nicolet land base (see Table 29).

There is a 6.7% (779 acres) reduction of suitable unoccupied habitat in the Fourmile project area immediately following treatment in 2023. Most of this can be attributed to the selection harvests in the Argonne Experimental Forest (737 acres) that reduce canopy closure to 75%. The canopy in these stands recovers within five years and the habitat becomes suitable by 2028. Five years following treatment in 2028 there is a 41-acre reduction in suitable unoccupied habitat in the Fourmile project area. This is due to even aged treatments that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Immediately following treatment in 2023, suitable unoccupied habitat in the ER/FL RD is reduced by 0.1% (65 acres). This is a result of short-term (≤ five years) losses from treatments in several project areas in the ER/FL RD including Fourmile (737 acres), Grubhoe (92 acres) Morgan Lake (247 acres), and Northwest Howell (514 acres) coupled with ingrowth from past projects in the ER/FL RD including Long Rail (1,599 acres). By 2028, the canopy in these stands have recovered and the habitat becomes suitable again, resulting in a 1.6% (1645 acres) increase of suitable unoccupied habitat in the ER/FL RD. Ingrowth of a stand occurs when the stand meets the minimum age required by a particular species, according to habitat models. For Mingan moonwort, when a stand of the appropriate forest type reaches 50 years of age, it is considered suitable habitat.

Immediately following treatment in 2023, there is a 0.8% (1,645 acres) reduction of suitable unoccupied habitat in the Nicolet land base. This is a result of short-term (≤ five years) losses in habitat resulting from treatments occurring in the Fourmile (737 acres), Grubhoe (92 acres), Morgan Lake (247 acres), and Northwest Howell (514 acres) project areas in the ER/FL RD and Honey Creek-Padus (1,074 acres) and Townsend (2,746 acres) in the LK/LA RD, coupled with ingrowth from the Long Rail (1,599 acres) project area in the ER/FL RD and Boulder (460 acres) and McCaslin (1,862 acres) project areas in the LK/LA RD. Five years following treatment in 2028, the canopy in these stands have recovered resulting in the habitat to become suitable and a 2.0% (3,926 acres) increase in suitable unoccupied habitat, primarily as a result of this ingrowth, or new habitat becoming available.

Immediately following treatment in 2023 there is a -0.8% and -0.4% difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 in the ER/FL RD and Nicolet land Base, respectively. This equates to an 830-acre difference at both scales that can be attributed to the proposed treatments in Alternative 2, of which 788 acres will recover within five years and become suitable habitat. Five years following treatment in 2028 there is a 41-acre difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 at all scales (Fourmile project area, ER/FL RD and Nicolet land base). This can be attributed to proposed even aged treatments in the Fourmile project area that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Conclusion

There are no direct effects since there are no occupied stands in the Fourmile project area proposed for treatment. There would be a short-term (≤ five years) reduction (737acres) in suitable unoccupied habitat in the Fourmile project area. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 3,009 acres of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance. There is a short-term (≤ five years) reduction in suitable unoccupied habitat at the ER/FL RD (0.1%) and Nicolet land base (0.8%) scales. Within five years those impacts would be expected to have dissipated and the area of suitable unoccupied habitat increases by 1.5% and 2.0%, in the ER/FL RD and Nicolet land base respectively, resulting from ingrowth.

Determination: May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Little Goblin Moonwort (*Botrychium mormo*)

Little goblin moonwort (*Botrychium mormo*), is small perennial fern with a single aboveground frond that is endemic to upper Great Lakes region of the United States (Nature Serve, 2019b). In Wisconsin, it is scattered across the northern counties and occurs under the full shade of northern hardwood forest dominated by sugar maple and basswood. It is closely associated with other *Botrychium* species in an assemblage referred to as a “genus community.” The optimal time to identify little goblin moonwort is mid-July through mid-August. Due to its small stature and periodic emergence it can easily be overlooked. Limiting factors for little goblin moonwort include changes in habitat (canopy closure, moisture regime, mycorrhizal fungi, organic matter, and soil characteristics) due to exotic earthworms, forestry practices, and road construction (Chadde, S. and G. Kudray, 2001b).

Little goblin moonwort has been documented at 166 sites in the CNNF; 152 (91.6%) sites are in the Nicolet land base, of which 57 (34.3%) sites are in the ER/FL RD. There are two (1.2%) sites in the Fourmile project area occurring in two stands that are not proposed for treatment.

Table 30. Area (ac) of occupied and suitable unoccupied little goblin moonwort habitat in proposed treatment areas of the Fourmile project area by Alternative. S is habitat suitable following treatment, U-ST is habitat unsuitable, for the short-term (≤ five years) following treatment and U-LT is habitat unsuitable for the long-term (≥ 50 years) following treatment.

				Alt. 1		Alt. 2	
Habitat	**Effect**	**Primary**	**Secondary**	**Area (ac)**	**N**	**Area (ac)**	**N**
Occupied-Suitable	S	None	None	188	2	188	2
Unoccupied-Suitable	S	None	None	11294	337	6099	182
		Selection	Canopy Gaps	0	0	4416	128
		Sub-Total		11294	337	10515	310
	U-ST	Improvement	Burn	0	0	17	1
			None	0	0	176	6
		Selection	Argonne	0	0	526	16
		Thin	None	0	0	18	1
		Sub-Total		0	0	737	24
	U-LT	Clearcut/Coppice	MSP	0	0	37	2
		Removal	None	0	0	5	1
		Sub-Total		0	0	42	3

Alternative 1 (No Action)

No treatment or connected actions would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effect.

Determination: *No impact due to no project activities.*

Alternative 2

Direct Effects

There are two occurrences in the Fourmile project area in two stands occupying 188 acres. There are no proposed treatments in these stands under Alternative 2. One stand proposed for treatment is within 200 feet of a little goblin moonwort occurrence and is immediately adjacent to occupied habitat. The harvest method proposed would result in residual canopy cover remaining at or above 75% and making occupied habitat unsuitable for the short-term (≤ five years). This little goblin moonwort occurrence would be protected by a 250 foot no activity, no disturbance buffer reducing the potential for direct impact. Additionally, the stand adjacent to the occurrence would also be harvested during frozen ground conditions, to reduce potential impacts to undocumented little goblin moonwort sites. Direct effects to the little goblin moonwort occurrence would be minimized due to these design features therefore no direct effects.

Indirect Effects

There are 11,294 acres of northern hardwood stands in the Fourmile project area considered suitable habitat, of which 5,195 are proposed for treatment in Alternative 2. As shown in Table 30, Alternative 2 proposes to treat 4,416 acres (39.1%) of suitable unoccupied habitat that would remain suitable after treatment, 737 acres (6.5%) of suitable unoccupied habitat would become unsuitable in the short-term (≤ five years) after treatment, and 42 acres (0.4%) of suitable unoccupied habitat would be become unsuitable for the long-term (≥ 50 years) after treatment. Based on the habitat models, the three stands that become unsuitable for the long-term (≥ 50 years) following treatment, are considered suitable habitat. However the site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Table 31. Recommended operating season within little goblin moonwort and bluntlobe grapefern habitat (ac) in the proposed treatments of Alternative 2 of the Fourmile project area. Little goblin moonwort and bluntlobe grapefern have similar habitat requirements and identical habitat models (FS VEG codes 81 to 89 with a size density code of 6 or 9 and a minimum stand age of 70).

Proposed Action		Year Round	Winter or Dry Summer-Fall	Winter Only				Total
Primary	Secondary			MA 2B	RFSS	Soils	Sub-Total	
Clearcut/ Coppice	MSP	37	0	0	0	0	0	37
Improvement	Burn	17	0	0	0	0	0	17
	None	40	36	26		74	100	176
Removal	None		0	5	0	0	5	5
Selection	Argonne	118	0	0	408	0	408	526
	Canopy Gaps	2528	144	1357	193	193	1744	4416
Thin	None	18	0	0	0	0	0	18
Total		2759	180	1388	601	267	2257	5195

As shown in Table 31, of the 5,195 acres of suitable unoccupied habitat proposed for treatment in Alternative 2, 2,257 acres (43.4%) would be restricted to frozen ground harvest for one the following reasons: 1) the presence of one or more RFSS plant species, 2) potential impacts to soil resources as determined by the Forest Soil Scientist, or 3) occurs in management area (MA) 2b, which restricts harvesting in northern hardwood stands to frozen-ground conditions only (USDA Forest Service, 2004a). Harvesting during frozen ground conditions minimizes soil disturbance and compaction (Kolka, R., A. Stebler, K. Brooks, C.H. Perry and M. Powers, 2012). Furthermore, winter logging may have fewer negative impacts than summer logging on vulnerable plant species and, in the long run, may help maintain plant biodiversity in managed forests (Wolf et.al (2008).

The remaining 2,939 acres of proposed treatments occurring in suitable unoccupied habitat in Alternative 2 do not restrict harvesting to frozen ground conditions. It is assumed stands with the winter or dry summer-fall seasonal operating restriction will be implemented during a dry summer-fall. Based on the 13% rate of soil disturbance caused by forestry practices estimated by the Forest Soil Scientist, there will be 382 acres of soil disturbance with in suitable unoccupied habitat in Alternative 2. These figures are likely inflated since soil disturbance in areas treated with individual tree selection harvests are assumed to be lessened, however an estimate has not yet been developed. There is an increased likelihood of NNIS introduction and spread in stands not harvested during frozen ground conditions due to altered physical site conditions, soil exposure, and disturbance regimes and reduced competition from native vegetation (Hansen, M.J. and A.P. Clevenger, 2005) (Parendes, L.A. and J.A. Jones, 2000), (Trombulak, S.C. and C.A. Frissell, 2000), (Von Der Lippe, M. and I. Kowarik, 2007). These factors could reduce habitat suitability in 56.6% of suitable stands not restricted to frozen ground harvest.

There would be a short-term (≤ five years) reduction (737 acres) in suitable unoccupied habitat in Alternative 2. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 43.4% of suitable unoccupied habitat would be harvested during frozen ground conditions, reducing potential impacts from the inadvertent trampling of individual plants caused by mechanical disturbance in previously undocumented sites and from the impacts of NNIS. 56.6% of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance and the impacts of NNIS.

Cumulative Effects

Table 32. Area (ac) of occupied and suitable unoccupied little goblin moonwort habitat within the Fourmile project area, ER/FL RD and Nicolet land base. Associated percentage values are the percent change from the current (2018) condition; negative values indicate a loss of habitat. The effects of all other projects within the analysis area are included in the 2023 and 2028 projections.

Fourmile Project Area		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	11,294		11,294	
	Occupied	188		188	
	Total	11,482		11,482	
Immediately following treatment (2023)	Unoccupied	11,294	0.0%	10,515	-6.9%
	Occupied	188	0.0%	188	0.0%
	Total	11,482	0.0%	10,703	-6.8%
Five years after treatment (2028)	Unoccupied	11,294	0.0%	11,252	-0.4%
	Occupied	188	0.0%	188	0.0%
	Total	11,482	0.0%	11,441	-0.4%
Eagle River-Florence Ranger District		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	99,770		99,770	
	Occupied	5,034		5,034	
	Total	104,804		104,804	
Immediately following treatment (2023)	Unoccupied	101,389	1.6%	100,582	0.8%
	Occupied	4,841	-3.8%	4,841	-3.8%
	Total	106,230	1.4%	105,423	0.6%
Five years after treatment (2028)	Unoccupied	102,224	2.5%	102,183	2.4%
	Occupied	5,034	0.0%	5,034	0.0%
	Total	107,259	2.3%	107,217	2.3%
Nicolet Land Base		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	172,379		172,379	
	Occupied	9,922		9,922	
	Total	182,301		182,301	
Immediately following treatment (2023)	Unoccupied	172,155	-0.1%	171,348	-0.6%
	Occupied	9,814	-1.1%	9,814	-1.1%
	Total	181,969	-0.2%	181,162	-0.6%
Five years after treatment (2028)	Unoccupied	177,808	3.1%	177,767	3.1%
	Occupied	10,018	1.0%	10,018	1.0%
	Total	187,826	3.0%	187,784	3.0%

Occupied Habitat

Currently there are 188 acres of occupied habitat within the Fourmile project area, 5,034 acres of occupied habitat in the ER/FL RD, and 9,922 acres of occupied habitat in the Nicolet land base. Immediately following project implementation in 2023, occupied habitat remains stable at 188 acres (0.0%) within the Fourmile project area. There is a 3.8% (193 acres) reduction of occupied habitat in ER/FL RD, and a 1.1 % (109 acres) reduction of occupied habitat in the Nicolet land base. Five years following project implementation in 2028 there is no change (0.0%) to occupied habitat in the Fourmile project area and ER/FL RD, as occupied habitat remains at 188 acres and 5,034 acres, respectively. There is 95 acres (1.0 %) increase of occupied habitat in the Nicolet land base, five years following project implementation (see Table 32).

In 2023, occupied habitat in the ER/FL RD is reduced by 3.8% (193 acres) due to short-term (≤ five years) losses from treatments occurring in the NW Howell (193 acres) project area in the ER/FL RD. By 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands results in no change (0.0%) to occupied habitat in the ER/FL RD by 2028.

In 2023, in the Nicolet land base there is a 1.1% (109 acres) reduction of occupied habitat due to short-term (≤ five years) losses in habitat resulting from treatments occurring in the NW Howell (193 acres) project area in the ER/FL RD, coupled with ingrowth from McCaslin (84 acres) in the LK/LA RD. By 2028, the canopy in these stands have recovered and the habitat becomes suitable. The recovery of these stands coupled with ingrowth from past project areas, results in a 1.0% (95 acres) increase in occupied habitat in the ER/FL RD by 2028. Ingrowth of a stand occurs when the stand meets the minimum age required by a particular species, according to habitat models. For little goblin moonwort, when a stand of the appropriate forest type reaches 70 years of age, it is considered suitable habitat.

All little goblin moonwort occurrences in stands proposed for treatment in all project areas will be protected from mechanical disturbances and edge effects by a 250 foot no activity, no disturbance buffer. No activity, no disturbance buffers may extend into unoccupied stands when an occurrence is immediately adjacent to that stand. Additionally, all occupied stands in all project areas would be harvested during frozen ground conditions, to reduce potential impacts to undiscovered sites. The frozen ground harvest restriction will be extended to unoccupied stands when the no activity, no disturbance buffer extends into that stand to reduce potential impacts to undiscovered sites and the highly suitable unoccupied habitat.

Unoccupied Habitat

Currently there are 11,294 acres of suitable unoccupied habitat within the Fourmile project area, 99,770 acres of suitable unoccupied habitat in the ER/FL RD, and 173,009 acres of suitable unoccupied habitat in the Nicolet land base. Immediately following project implementation in 2023, there is a 6.9% (779 acres) reduction of suitable unoccupied habitat within the Fourmile project area, a 0.8% (812 acres) increase of suitable unoccupied habitat in ER/FL RD, and a 0.6% (1,031 acres) reduction of suitable unoccupied habitat in the Nicolet land base. Five years following project implementation in 2028, there is a 0.4% (42 acres) reduction of suitable unoccupied habitat within the Fourmile project area, a 2.4% (2,413 acres) increase of suitable unoccupied habitat in ER/FL RD, and a 3.0% (5,388) acres) increase of suitable unoccupied habitat in the Nicolet land base (see Table 32).

There is a 6.7% (779 acres) reduction of suitable unoccupied habitat in the Fourmile project area immediately following treatment in 2023. Most of this can be attributed to the selection harvests in the Argonne Experimental Forest (737 acres) that reduce canopy closure to 75%. The canopy in these stands recovers within five years and the habitat becomes suitable by 2028. Five years following treatment in 2028 there is a 41-acre reduction in suitable unoccupied habitat in the Fourmile project area. This is due to even aged treatments that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

In 2023, suitable unoccupied habitat in the ER/FL RD increases by 0.8% (812 acres). This is a result of short-term (≤ five years) losses from treatments in several project areas in the ER/FL RD including Fourmile (737 acres), Grubhoe (92 acres), Morgan Lake (242 acres), and Northwest Howell (300 acres) coupled with ingrowth from past projects in the ER/FL RD including Long Rail (1,572 acres) and other untreated and non-project and areas. By 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands results in a 2.4% (2,413 acres) increase in suitable unoccupied habitat in the ER/FL RD by 2028. Ingrowth of a stand occurs when the stand meets the minimum age required by a

particular species, according to habitat models. For little goblin moonwort, when a stand of the appropriate forest type reaches 70 years of age, it is considered suitable habitat.

Immediately following treatment in 2023, there is a 0.6% (1,031 acres) reduction of suitable unoccupied habitat in the Nicolet land base. This is a result of short-term (≤ five years) losses in habitat resulting from treatments occurring in the Fourmile (737 acres), Grubhoe (92 acres), Morgan Lake (242 acres), and Northwest Howell (300 acres) project areas in the ER/FL RD and Honey Creek-Padus (1,071 acres) and Townsend (2,746 acres) in the LK/LA RD, coupled with ingrowth from the Long Rail (1,572 acres) project area in the ER/FL RD and Boulder (460 acres) and McCaslin (1,089 acres) in the LK/LA RD. By 2028, the canopy in these stands have recovered resulting in the habitat to become suitable and a 3.1% (5,388) increase in suitable unoccupied habitat, primarily as a result of this ingrowth, or new habitat becoming available.

Immediately following treatment in 2023 there is a -0.8% and -0.5% difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 in the ER/FL RD and Nicolet land Base, respectively. This equates to an 807-acre difference at both scales that can be attributed to the proposed treatments in Alternative 2, of which 765 acres will recover within five years and become suitable habitat. Five years following treatment in 2028 there is a 41-acre difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 at all scales (Fourmile project area, ER/FL RD and Nicolet land base). This can be attributed to proposed even aged treatments in the Fourmile project area that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Conclusion

Direct effects to the little goblin moonwort occurrence would be minimized due to design features therefore there are no direct effects. There would be a short-term (≤ five years) reduction (737 acres) in suitable unoccupied habitat in the Fourmile project area. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 2,939 acres of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance and NNIS. Following treatment there is a 0.8% increase and 0.6% decrease in unoccupied suitable habitat at the ER/FL RD and Nicolet land base scales, respectively. Within five years impacts would be expected to have dissipated and the area of suitable unoccupied habitat increases by 2.3% and 3.0%, in the ER/FL RD and Nicolet land base respectively, resulting from ingrowth.

Determination: May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Bluntlobe Grapefern *(Botrychium oneidense*)

Bluntlobe grapefern (*Botrychium oneidense*) is a small, perennial, wintergreen fern with separate sterile and fertile fronds that is found across the northeastern United States (Nature Serve, 2019c). In Wisconsin, it is scattered across the northern counties and occurs in low, wet shady woods and swamps including the edges of woodland ephemeral ponds and transitional zones between upland and lowland forest. It is closely associated with other *Botrychium* species in an assemblage referred to as a “genus community.” The optimal time to identify bluntlobe grapefern is late June through late September. Due to its small stature and periodic emergence it can easily be overlooked. Limiting factors for bluntlobe grapefern include changes in habitat (canopy closure, moisture regime, mycorrhizal fungi, organic matter, and soil characteristics) due to exotic earthworms, forestry practices, and road construction (Chadde, S. and G. Kudray, 2003a). Bluntlobe grapefern has been documented at 101 sites in the CNNF; 98 (97.0%) sites are in the Nicolet land base, of which 49 (48.5%) sites are in the ER/FL RD. There are two (2.0%) sites in the Fourmile project area occurring in two stands, of which one is proposed for treatment.

Table 33. Area (ac) of occupied and suitable unoccupied bluntlobe grapefern habitat in proposed treatment areas of the Fourmile project area by Alternative. S is habitat suitable following treatment, U-ST is habitat unsuitable, for the short-term (≤ five years) following treatment and U-LT is habitat unsuitable for the long-term (≥ 50 years) following treatment.

				Alt. 1		Alt. 2	
Habitat	**Effect**	**Primary**	**Secondary**	**Area (ac)**	**N**	**Area (ac)**	**N**
Occupied-Suitable	S	None	None	176	2	68	1
		Selection	Canopy Gaps	0	0	108	1
		Sub-Total		176	2	176	2
Unoccupied-Suitable	S	None	None	11306	337	6219	183
		Selection	Canopy Gaps	0	0	4308	127
		Sub-Total		11306	337	10527	310
	U-ST	Improvement	Burn	0	0	17	1
			None	0	0	176	6
		Selection	Argonne	0	0	526	16
		Thin	None	0	0	18	1
		Sub-Total		0	0	737	24
	U-LT	Clearcut/Coppice	MSP	0	0	37	2
		Removal	None	0	0	5	1
		Sub-Total		0	0	42	3

Alternative 1 - *No Action*

No treatment or connected actions would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effect.

Determination: *No impact due to no project activities.*

Alternative 2 – Action Alternative

Direct Effects

There are two occurrences of bluntlobe grapefern in two stands occupying 176 acres in the Fourmile project area, of which one is proposed for treatment. The harvest method proposed would result in residual canopy cover remaining at or above 80% and occupied habitat remaining suitable following harvest. Bluntlobe grapefern occurrences within stands proposed for treatment would be protected by a 250 foot no activity, no disturbance buffer reducing the potential for direct impact. Occupied stands would also be harvested during frozen ground conditions, to reduce potential impacts to undocumented bluntlobe grapefern sites. Direct effects to bluntlobe grapefern occurrences would be minimized due to these design features.

Indirect Effects

There are 11,306 acres of northern hardwood stands in the Fourmile project area considered suitable habitat, of which 5,087 are proposed for treatment in Alternative 2. As shown in Table 33, Alternative 2 proposes to treat 4,308 acres (38.1%) of suitable unoccupied habitat that would remain suitable after treatment, 737 acres (6.5%) of suitable unoccupied habitat would become unsuitable in the short-term (≤ five years) after treatment, and 42 acres (0.4%) of suitable unoccupied habitat would be become unsuitable for the long-term (≥ 50 years) after treatment. Based on the habitat models, the three stands that become unsuitable for the long-term (≥ 50 years) following treatment, are considered suitable habitat. However, the site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

As shown in Table 31, of the 5,195 acres of suitable unoccupied habitat proposed for treatment in Alternative 2, 2,257 acres (43.4%) would be restricted to frozen ground harvest for one the following reasons: 1) the presence of one or more RFSS plant species, 2) potential impacts to soil resources as determined by the Forest Soil Scientist, or 3) occurs in management area (MA) 2b, which restricts harvesting in northern hardwood stands to frozen-ground conditions only (USDA Forest Service, 2004a). Harvesting during frozen ground conditions minimizes soil disturbance and compaction (Kolka, R., A. Stebler, K. Brooks, C.H. Perry and M. Powers, 2012). Furthermore, winter logging may have fewer negative impacts than summer logging on vulnerable plant species and, in the long run, may help maintain plant biodiversity in managed forests (Wolf, A.T., L. Parker, G. Fewless, K. Corio, J. Sundance, R. Howe, and H. Gentry, 2008).

The remaining 2,939 acres of proposed treatments occurring in suitable unoccupied habitat in Alternative 2 do not restrict harvesting to frozen ground conditions. It is assumed stands with the winter or dry summer-fall seasonal operating restriction will be implemented during a dry summer-fall. Based on the 13% rate of soil disturbance caused by forestry practices estimated by the Forest Soil Scientist, there will be 382 acres of soil disturbance with in suitable unoccupied habitat in Alternative 2. These figures are likely inflated since soil disturbance in areas treated with individual tree selection harvests are assumed to be lessened, however an estimate has not yet been developed. There is an increased likelihood of NNIS introduction and spread in stands not harvested during frozen ground conditions due to altered physical site conditions, soil exposure, and disturbance regimes and reduced competition from native vegetation (Hansen, M.J. and A.P. Clevenger, 2005), (Parendes, L.A. and J.A. Jones, 2000), (Trombulak, S.C. and C.A. Frissell, 2000), (Von Der Lippe, M. and I. Kowarik, 2007). These factors could reduce habitat suitability in 56.6% of suitable stands not restricted to frozen ground harvest.

There would be a short-term (≤ five years) reduction (737 acres) in suitable unoccupied habitat in Alternative 2. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 43.4% of suitable unoccupied habitat would be harvested during frozen ground conditions, reducing potential impacts from the inadvertent trampling of individual plants caused by mechanical disturbance in previously undocumented sites and from the impacts of NNIS. 56.6% of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance and the impacts of NNIS.

Cumulative Effects

Table 34. Area (ac) of occupied and suitable unoccupied bluntlobe grapefern habitat within the Fourmile project area, ER/FL RD and Nicolet land base. Associated percentage values are the percent change from the current (2018) condition; negative values indicate a loss of habitat. The effects of all other projects within the analysis area are included in the 2023 and 2028 projections.

Fourmile Project Area		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	11,306		11,306	
	Occupied	176		176	
	Total	11,482		11,482	
Immediately following treatment (2023)	Unoccupied	11,306	0.0%	10,527	-6.9%
	Occupied	176	0.0%	176	0.0%
	Total	11,482	0.0%	10,703	-6.8%
Five years after treatment (2028)	Unoccupied	11,306	0.0%	11,265	-0.4%
	Occupied	176	0.0%	176	0.0%
	Total	11,482	0.0%	11,441	-0.4%
Eagle River-Florence Ranger District		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	102,441		102,441	
	Occupied	2,839		2,839	
	Total	105,280		105,280	
Immediately following treatment (2023)	Unoccupied	104,061	1.6%	103,250	0.8%
	Occupied	2,646	-6.8%	2,646	-6.8%
	Total	106,707	1.4%	105,896	0.6%
Five years after treatment (2028)	Unoccupied	104,897	2.4%	104,855	2.4%
	Occupied	2,839	0.0%	2,839	0.0%
	Total	107,736	2.3%	107,694	2.3%
Nicolet Land Base		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	182,014		182,014	
	Occupied	9,064		9,064	
	Total	191,078		191,078	
Immediately following treatment (2023)	Unoccupied	182,701	0.4%	181,890	-0.1%
	Occupied	8,584	-5.3%	8,583	-5.3%
	Total	191,284	0.1%	190,473	-0.3%
Five years after treatment (2028)	Unoccupied	188,079	3.3%	188,037	3.3%
	Occupied	9,491	4.7%	9,491	4.7%
	Total	197,571	3.4%	197,529	3.4%

Occupied Habitat

Currently there are 176 acres of occupied habitat within the Fourmile project area, 2,839 acres of occupied habitat in the ER/FL RD, and 9,064 acres of occupied habitat in the Nicolet land base. Immediately following project implementation in 2023, occupied habitat remains stable at 176 acres (0.0%) within the Fourmile project area. There is a 6.8% (193 acres) and a 5.3% (481 acres) reduction in occupied habitat in ER/FL RD, and the Nicolet land base, respectively. Five years following project implementation in 2028, there is no change (0.0%) to occupied habitat in the Fourmile project area and ER/FL RD, as occupied habitat remains at 176 acres and 2,839 acres, respectively. There is a 4.7% (427 acres) increase in occupied habitat in the Nicolet land base five years following treatment in 2028 (see Table 34).

In 2023, suitable occupied habitat in the ER/FL RD is reduced by 6.8% (193 acres) due to short-term (≤ five years) losses from treatments occurring in the NW Howell (193 acres) project area in the ER/FL RD. Five years following treatment in 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands results in no change (0.0%) to suitable occupied habitat in the ER/FL RD by 2028.

In 2023, in the Nicolet land base there is a 5.3% (481 acres) reduction of occupied habitat due to short-term (≤ five years) losses in habitat resulting from treatments occurring in the NW Howell (193 acres) project area in the ER/FL RD and Townsend (287 acres) project area in the LK/LA RD. Five years following treatment in 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands coupled with ingrowth from the McCaslin (427 acres) project area in the LK/LA RD results in a 4.7% (427 acres) increase in occupied habitat in the Nicolet land base by 2028. Ingrowth of a stand occurs when the stand meets the minimum age required by a particular species, according to habitat models. For bluntlobe grapefern, when a stand of the appropriate forest type reaches 70 years of age, it is considered suitable habitat.

All bluntlobe grapefern occurrences in stands proposed for treatment in all project areas will be protected from mechanical disturbances and edge effects by a 250 foot no activity, no disturbance buffer. Additionally, all occupied stands in all project areas would be harvested during frozen ground conditions, to reduce potential impacts to undiscovered sites.

Unoccupied Habitat

Currently there are 11,306 acres of suitable unoccupied habitat within the Fourmile project area, 102,441 acres of suitable unoccupied habitat in the ER/FL RD, and 182,014 acres of suitable unoccupied habitat in the Nicolet land base. Immediately following project implementation in 2023, there is a 6.9% (779 acres) reduction of suitable unoccupied habitat within the Fourmile project area, a 0.8% (809 acres) increase in suitable unoccupied habitat in ER/FL RD, and a 0.1% (125 acres) reduction of suitable unoccupied habitat in the Nicolet land base. Five years following project implementation in 2028, there is a 0.4% (42 acres) reduction of suitable unoccupied habitat within the Fourmile project area, a 2.4% (2,414 acres) increase of suitable unoccupied habitat in ER/FL RD, and a 3.3% (6,023 acres) increase of suitable unoccupied habitat in the Nicolet land base (see Table 34).

There is a 6.9% (779 acres) reduction of suitable unoccupied habitat in the Fourmile project area immediately following treatment in 2023. Most of this can be attributed to the selection harvests in the Argonne Experimental Forest (737 acres) that reduce canopy closure to 75%. The canopy in these stands recovers within five years and the habitat becomes suitable by 2028. Five years following treatment in 2028 there is a 42-acre reduction in suitable unoccupied habitat in the Fourmile project area. This is due to even aged treatments that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

In 2023, immediately following treatment, suitable unoccupied habitat in the ER/FL RD increases by 0.8% (809 acres). This is a result of short-term (≤ five years) losses from treatments in several project areas in the ER/FL RD including Fourmile (737 acres), Grubhoe (92 acres), Morgan Lake (242 acres), and Northwest Howell (300 acres), coupled with ingrowth from past projects in the ER/FL RD including Long Rail (1,573 acres) and other untreated and non-project and areas. By 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands results in a 2.4% (2,414 acres) increase in suitable unoccupied habitat in the ER/FL RD by 2028. Ingrowth of a stand occurs when the stand meets the minimum age required by a particular species, according to habitat models. For

bluntlobe grapefern, when a stand of the appropriate forest type reaches 70 years of age, it is considered suitable habitat.

Immediately following treatment in 2023, there is a 0.1% (125 acres) reduction of suitable unoccupied habitat in the Nicolet land base. This is a result of short-term (≤ five years) losses in habitat resulting from treatments occurring in the Fourmile (737 acres), Grubhoe (92 acres), Morgan Lake (242 acres), and Northwest Howell (300 acres) project areas in the ER/FL RD and Honey Creek-Padus (1,074 acres) and Townsend (2,458 acres) in the LK/LA RD, coupled with ingrowth from the Long Rail (1,573 acres) project area in the ER/FL RD and Boulder (435 acres) and McCaslin (1,434 acres) in the LK/LA RD. By 2028, the canopy in these stands have recovered resulting in the habitat to become suitable and a 3.3% (6,023 acres) increase in suitable unoccupied habitat, primarily as a result of this ingrowth, or new habitat becoming available.

Immediately following treatment in 2023 there is a -0.8% and -0.5% difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 in the ER/FL RD and Nicolet land Base, respectively. This equates to an 811-acre difference at both scales that can be attributed to the proposed treatments in Alternative 2, of which 765 acres will recover within five years and become suitable habitat. Five years following treatment in 2028 there is a 42-acre difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 at all scales (Fourmile project area, ER/FL RD and Nicolet land base). This can be attributed to proposed even aged treatments in the Fourmile project area that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Conclusion

Direct effects to the bluntlobe grapefern occurrences would be minimized due to design features therefore there are no direct effects. There would be a short-term (≤ five years) reduction (737 acres) in suitable unoccupied habitat in the Fourmile project area. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 2,939 acres of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance. Following treatment there is a 0.8% increase and 0.1% decrease in unoccupied suitable habitat at the ER/FL RD and Nicolet land base scales, respectively. Within five years impacts would be expected to have dissipated and the area of suitable unoccupied habitat increases by 2.4% and 3.3%, in the ER/FL RD and Nicolet land base respectively, resulting from ingrowth.

Determination: May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Ternate Grapefern (*Botrychium rugulosum*)

Ternate grapefern (*Botrychium rugulosum*) is a small, perennial, wintergreen fern with separate sterile and fertile fronds that is found along the St. Lawrence Seaway and Great Lakes region of the United States (Nature Serve, 2019d).In Wisconsin it is found in the northern-most counties and counties in central sand plain. Its habitat is variable, but is generally found growing in open to semi-shaded areas in loamy-sand to sandy, acidic soils. It is closely associated with other *Botrychium* species in an assemblage referred to as a "genus community". The optimal time to identify ternate grapefern is early June through late August. Due to its small stature and periodic emergence it can easily be overlooked. The most limiting factor to ternate grapefern is succession to a closed canopy forest (Chadde, S. and G. Kudray, 2003b). Ternate grapefern has been documented at seven sites in the CNNF; three (42.9%) sites are in the Nicolet land base, of which three (42.9%) sites are in the ER/FL RD. There is one (14.3%) site in the Fourmile project area occurring in one stand that is not proposed for treatment.

Alternative 1 - *No Action*

No vegetation treatments would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effect.

Determination: No impact due to no project activities.

Alternative 2 – Action Alternative

No project activities are proposed within occupied habitat. Three stands are proposed for treatment within 500 feet of occupied habitat, with one stand immediately adjacent to occupied habitat. The areas in which ternate grapefern occupy are also designated heritage sites that will be protected by a no activity, no disturbance buffer. Implementation of project activities with those design features will not impact occupied habitat therefore no direct or indirect impacts. Without direct or indirect effect, there can be no cumulative effect.

Determination: No impact from project activities due to protection from project design features.

Spreading woodfern (*Dryopteris expansa*)

Spreading woodfern (*Dryopteris expansa*) is a rhizomatous, deciduous fern that is found in the western half of the US and Great Lakes region of the United States (Nature Serve, 2019e). In Wisconsin it is scattered across the northern counties and occurs under the full shade of mixed northern hardwood forest in the close proximity of exposed bedrock or talus, cool air drainage and high moisture. It is often found growing in close association with other rare to uncommon fern species including Braun's hollyfern (*Polystichum braunii*) and maidenhair spleenwort (*Asplenium trichomanes* var. *trichomanes*). The optimal time to identify spreading woodfern is late May through late September. Threats include habitat degradation (altered canopy closure and hydrological function) resulting from timber harvests and road construction **(USDA Forest Service, 2003)**. Spreading woodfern has been documented at 17 sites in the CNNF; one (5.9%) site is in the Nicolet land base, of which one (5.9%) site is in the ER/FL RD. There is one (5.9%) site in the Fourmile project area occurring in one stand that is not proposed for treatment.

Alternative 1 - *No Action*

No vegetation treatments would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effects.

Determination: No impact due to no project activities.

Alternative 2 – *Action Alternative*

No project activities proposed within occupied habitat therefore no direct effect. Habitat models indicate there are 12,734 acres of suitable habitat in the Fourmile project area, of which 5,586 are proposed for treatment. The habitat requirements for spreading woodfern on the Nicolet land base are more specific than what is used in the habitat based models (northern hardwood forests (FS Veg codes 20 and 81 to 89 with a size density code of 6 or 9) with closed canopy conditions). The actual habitat requirements of spreading woodfern on the Nicolet land base are more comparable to that of Braun’s hollyfern, requiring a specific microhabitat that includes moisture, cool air drainage, and shading from canopy. Using the habitat characteristics of Braun’s hollyfern as a proxy for spreading woodfern, it was determined additional suitable unoccupied habitat did not occur within the Fourmile project area. No proposed treatments occur within unoccupied suitable habitat, therefore no indirect effect. Without direct or indirect effect, there can be no cumulative effect.

Determination: No impact due to no project activities within occupied or suitable occupied habitat.

Butternut (Juglans cinerea)

Butternut (*Juglans cinerea*) is a medium sized, short-lived, mast-producing tree that is found throughout the eastern half of United States (Nature Serve, 2019f). It is found throughout Wisconsin except for the northern-most counties and occurs on rich, loamy, well-drained soils as well as on drier, rocky soils when associated with limestone. Rarely a common tree, it is typically found as scattered individuals, usually within canopy gaps in northern hardwood stands (Shultz, J., 2003). Butternut is easily identifiable year long, buy its bark. Butternut’s range has been under severe

contraction due butternut canker which has infected a large percentage of trees throughout its range and is nearly always fatal (Nature Serve, 2019a), (Ostry, M. E., M. E. Mlelke, and D. D. Skilling, 1994), (Shultz, J., 2003). Butternut has been documented at 86 sites in the CNNF; 53 (61.6%) are in the Nicolet land base, of which 2 (2.3%) sites are in ER/FL RD. There are no known sites within the Fourmile project area. The closest occurrences are approximately 20 miles to the south-southeast of the project area. The Fourmile project area contains suitable habitat and its probable there are occurrences within the project area.

Alternative 1 - *No Action*

No vegetation treatments would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effect.

Determination: No impact due to no project activities.

Alternative 1 – *Action Alternative*

There are no known occurrence in the project area therefore no direct effects. There is 13,554 of acres of northern hardwood stands in the Fourmile project area that are considered suitable habitat, of which 5,923 are proposed for treatment. Forest Plan guidelines for protecting individual butternut trees and seed sources (USDA Forest Service, 2004a) will be followed during project implementation. Additionally, individual tree selection harvest with canopy gaps, would benefit butternut trees by providing regeneration opportunities (Ostry, M. E., M. E. Mlelke, and D. D. Skilling, 1994).Implementation of project activities with Forest Plan guidelines will not impact undiscovered trees or suitable unoccupied habitat therefore no indirect effects. Without direct or indirect effects, there can be no cumulative effect.

Determination; No impact from project activities due to protection from Forest Plan guidelines.

American Ginseng (*Panax quinquefolius*)

American Ginseng is a slow growing, long-lived, perennial herb that is found across the eastern half of the United States (NatureServe 2019g). It is found throughout Wisconsin and occurs in rich loamy soils under the full shade of mixed northern hardwood forest often dominated by sugar maple and basswood. American ginseng is identifiable as early as late spring but is easiest in September due to its deep red fruit. Threats to American ginseng population viability include illegal harvesting of roots, altered canopy closure, habitat fragmentation and herbivory by white-tail deer (*Odocoileus virginianus*) (Kaufman, 2006) (McGraw, et.al. (2013), (Nature Serve, 2019f), (USDA Forest Service, 2002).

American ginseng has been documented at 676 sites in the CNNF; 640 (94.7%) sites are in the Nicolet land base, of which 217 (32.1%) sites are in the ER/FL RD. There are 18 (2.7%) sites in the Fourmile project area occurring in 11 stands, of which six are proposed for treatment.

Table 35. Area (ac) of occupied and suitable unoccupied American ginseng habitat in proposed treatment areas of the Fourmile project area by Alternative. Alternative 2 has been further divided to exclude proposed stands in the Argonne Experimental Forest. Occupied other habitat are stands with known American ginseng occurrences within atypical forest types, but suitable soils. S is habitat suitable following treatment, U-ST is habitat unsuitable, for the short-term (≤ five years) following treatment and U-LT is habitat unsuitable for the long-term (≥ 50 years) following treatment.

				Alt. 1		Alt. 2			
						With Argonne		Without Argonne	
Habitat	**Effect**	**Primary**	**Secondary**	**Area (ac)**	**N**	**Area (ac)**	**N**	**Area (ac)**	**N**
Occupied-Other	S	None	None	61	2	61	2	61	2
Occupied-Suitable	S	None	None	627	9	134	3	134	3
		Selection	Canopy Gaps	0	0	86	2	86	2
		Sub-Total		627	9	219	5	219	5
	U-ST	Selection	Argonne	0	0	408	4	0	0
Unoccupied-Suitable	S	None	None	11007	339	6162	182	6162	182
		Selection	Canopy Gaps	0	0	4474	134	4474	134
		Sub-Total		11007	339	10636	316	10636	316
	U-ST	Improvement	Burn	0	0	17	1	17	1
		Improvement	None	0	0	176	6	176	6
		Selection	Argonne	0	0	118	12	0	0
		Thin	None	0	0	18	1	18	1
		Sub-Total		0	0	330	20	211	8
	U-LT	Clearcut/ Coppice	MSP	0	0	37	2	37	2
		Removal	None	0	0	5	1	5	1
		Sub-Total		0	0	42	3	42	3

Alternative 1 - *No Action*

No treatment or connected actions would occur; therefore, there would be no direct or indirect effects. Without direct or indirect effect, there can be no cumulative effect.

Determination: *No impact due to no project activities.*

Alternative 2 – Action Alternative

Direct Effects

There are 18 documented American ginseng sites in the Fourmile project area occurring in 11 stands (689 acres), of which six (408 acres) are proposed for treatment. The harvest method proposed in two stands (86 acres) would result in residual canopy cover remaining at or above 80% and occupied habitat would remain suitable following harvest. The harvest method proposed in four stands (408 acres) within the Argonne Experimental Forest would result in residual canopy cover remaining at or above 75% and would make occupied habitat unsuitable for the short-term (≤ five years). Within five years the canopy recovers and those impacts have dissipated. These treatments within the Argonne Experimental Forest would have a direct impact on occupied American ginseng habitat in in the Fourmile project area reducing occupied habitat 59.2% (408 acres). The objective of these treatments is to continue several long-term silviculture studies, the Farm Woodlot study established in 1949, the Cutting Methods study established in 1951, and the Managed Silviculture Study established in 2008. Continuing these studies and treating these stands maintains study objectives, provides modern data to long-term records, and elevates their demonstration and education value.

American ginseng occurrences within stands proposed for treatment would be protected by a 100 foot no activity, no disturbance buffer reducing the potential for direct impact. Occupied stands would also be harvested during frozen ground conditions, to reduce potential impacts to undocumented American ginseng sites

Indirect Effects

There are 11,007 acres of northern hardwood stands in the Fourmile project area considered suitable habitat, of which 4,845 acres are proposed for treatment in Alternative 2. As shown in Table 35, Alternative 2 proposes to treat 4,474 acres (40.6%) of suitable unoccupied habitat that would remain suitable after treatment, 330 acres (3.0%) of suitable unoccupied habitat would become unsuitable in the short-term (≤ five years) after treatment, and 42 acres (0.4%) of suitable unoccupied habitat would be become unsuitable for the long-term (≥ 50 years) after treatment. Based on the habitat models, the three stands that become unsuitable for the long-term (≥ 50 years) following treatment, are considered suitable habitat. However the site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

As shown in Table 31 of the 5,339 acres of suitable unoccupied habitat proposed for treatment in Alternative 2, 2,330 acres (43.6%) would be restricted to frozen ground harvest for one the following reasons: 1) the presence of one or more RFSS plant species, 2) potential impacts to soil resources as determined by the Forest Soil Scientist, or 3) occurs in management area (MA) 2b, which restricts harvesting in northern hardwood stands to frozen-ground conditions only (USDA Forest Service, 2004a). Harvesting during frozen ground conditions minimizes soil disturbance and compaction (Kolka, R., A. Stebler, K. Brooks, C.H. Perry and M. Powers, 2012). Furthermore, winter logging may have fewer negative impacts than summer logging on vulnerable plant species and, in the long run, may help maintain plant biodiversity in managed forests (Wolf, A.T., L. Parker, G. Fewless, K. Corio, J. Sundance, R. Howe, and H. Gentry, 2008).

The remaining 3,009 acres of proposed treatments occurring in suitable unoccupied habitat in Alternative 2 do not restrict harvesting to frozen ground conditions. It is assumed stands with the winter or dry summer-fall seasonal operating restriction will be implemented during a dry summer-fall. Based on the 13% rate of soil disturbance caused by forestry practices estimated by the Forest Soil Scientist, there will be 391 acres of soil disturbance with in suitable unoccupied habitat in Alternative 2. These figures are likely inflated since soil disturbance in areas treated with individual tree selection harvests are assumed to be lessened, however an estimate has not yet been developed. There is an increased likelihood of NNIS introduction and spread in stands not harvested during frozen ground conditions due to altered physical site conditions, soil exposure, and disturbance regimes and reduced competition from native vegetation

(Hansen, M.J. and A.P. Clevenger, 2005), (Parendes, L.A. and J.A. Jones, 2000), (Trombulak, S.C. and C.A. Frissell, 2000), (Von Der Lippe, M. and I. Kowarik, 2007). These factors could reduce habitat suitability in 56.4% of suitable stands not restricted to frozen ground harvest.

There would be a short-term (≤ five years) reduction (330 acres) in suitable unoccupied habitat in Alternative 2. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 43.4% of suitable unoccupied habitat would be harvested during frozen ground conditions, reducing potential impacts from the inadvertent trampling of individual plants caused by mechanical disturbance in previously undocumented sites and from the impacts of NNIS. 56.6% of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance and the impacts of NNIS.

Cumulative Effects

Table 36. Area (ac) of occupied and suitable unoccupied American ginseng habitat within the Fourmile project area, ER/FL RD and Nicolet land base. Associated percentage values are the percent change from the current (2018) condition; negative values indicate a loss of habitat. The effects of all other projects within the analysis area are included in the 2023 and 2028 projections.

Fourmile Project Area		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	11,007		11,007	
	Occupied	689		689	
	Total	11,696		11,696	
Immediately following treatment (2023)	Unoccupied	11,007	0.00%	10,636	-3.40%
	Occupied	689	0.00%	281	-59.20%
	Total	11,696	0.00%	10,917	-6.70%
Five years after treatment (2028)	Unoccupied	11,007	0.00%	10,965	-0.40%
	Occupied	689	0.00%	689	0.00%
	Total	11,696	0.00%	11,654	-0.40%
Eagle River-Florence Ranger District		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	98,469		98,469	
	Occupied	8,223		8,223	
	Total	106,692		106,692	
Immediately following treatment (2023)	Unoccupied	99,129	0.70%	98,751	0.30%
	Occupied	8,280	0.70%	7,873	-4.30%
	Total	107,409	0.70%	106,623	-0.10%
Five years after treatment (2028)	Unoccupied	99,849	1.40%	99,807	1.40%
	Occupied	8,486	3.20%	8,486	3.20%
	Total	108,335	1.50%	108,293	1.50%
Nicolet Land Base		**Alt. 1**		**Alt. 2**	
Currently (2018)	Unoccupied	165,297		165,297	
	Occupied	31,785		31,785	
	Total	197,082		197,082	
Immediately following treatment (2023)	Unoccupied	165,702	0.20%	165,324	0.00%
	Occupied	30,708	-3.40%	30,301	-4.70%
	Total	196,410	-0.30%	195,624	-0.70%
Five years after treatment (2028)	Unoccupied	168,964	2.20%	168,922	2.20%
	Occupied	32,233	1.40%	32,233	1.40%
	Total	201,197	2.10%	201,155	2.10%

Occupied Habitat

Currently there are 689 acres of occupied habitat within the Fourmile project area, 8,223 acres of occupied habitat in the ER/FL RD, and 31,785 acres of occupied habitat in the Nicolet land base. Immediately following project implementation in 2023, there is a 59.2% (408 acres) reduction of occupied habitat in the Fourmile project area, a 4.3% (350 acres) reduction of occupied habitat in ER/FL RD, and a 4.7% (1,485 acres) reduction of occupied habitat in the Nicolet land base. Five years following project implementation in 2028, there is no change (0.0%) to occupied habitat in Fourmile project area, as occupied habitat remains

at 689 acres. While there is a 3.2% (263 acres) and 1.4% (447 acres) increase of occupied habitat in the ER/FL RD and Nicolet land base five years following project implementation, respectively (see Table 36).

In 2023, suitable occupied habitat in the ER/FL RD is reduced by 4.3% (350 acres) due to short-term (≤ five years) losses from treatments occurring in the Fourmile (408 acres), Morgan Lake (13 acres), and NW Howell (193 acres) project areas in the ER/FL RD, coupled with ingrowth from past projects in the ER/FL RD including the Long Rail (263 acres) project area. Five years following treatment in 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands results in a 3.2% (263 acres) increase to suitable occupied habitat in the ER/FL RD by 2028. Ingrowth of a stand occurs when the stand meets the minimum age required by a particular species, according to habitat models. For American ginseng, when a stand of the appropriate forest type reaches 50 years of age, it is considered suitable habitat.

In 2023, in the Nicolet land base there is a 4.7% (1,485 acres) reduction of occupied habitat due to short-term (≤ five years) losses in occupied habitat resulting from treatments occurring in various projects including the Fourmile (408 acres), Morgan Lake (13 acres), and NW Howell (193 acres) in the ER/FL RD and McCaslin (36 acres) and Townsend (1,319 acres) in the LK/LA RD. By 2028, the canopy in these stands have recovered and habitat becomes suitable. The recovery of these stands coupled with ingrowth from past project areas, Long Rail (263 acres) in the ER/FL RD and Boulder (57 acres) and McCaslin (127) in the LK/LA RD, results in a 1.4 % (447 acres) increase in occupied habitat in the Nicolet land base by 2028.

American ginseng occurrences in stands proposed for selection harvest with canopy gaps in all project areas will be protected from mechanical disturbances and edge effects by a 100 foot no activity, no disturbance buffer. American ginseng occurrences in stands proposed for selection harvest in the Argonne Experimental Forest will be protected from mechanical disturbances and edge effects by a 250 foot no activity, no disturbance buffer. No activity, no disturbance buffers may extend into unoccupied stands when an occurrence is immediately adjacent to that stand. Additionally, all occupied stands in all project areas would be harvested during frozen ground conditions, to reduce potential impacts to undiscovered sites. The frozen ground harvest restriction will be extended to unoccupied stands when the no activity, no disturbance buffer extends into that stand to reduce potential impacts to undiscovered sites and the highly suitable unoccupied habitat.

Unoccupied Habitat

Currently there are 11,007 acres of suitable unoccupied habitat within the Fourmile project area, 98,469 acres of suitable unoccupied habitat in the ER/FL RD, and 165,297 acres of suitable unoccupied habitat in the Nicolet land base. Immediately following project implementation in 2023, there is a 3.4% (371 acres) reduction of suitable unoccupied habitat within the Fourmile project area, a 0.3% (281 acres) increase in suitable unoccupied habitat in ER/FL RD, and a 0.0% (27 acres) reduction of suitable unoccupied habitat in the Nicolet land base. Five years following project implementation in 2028, there is a 0.4% (42 acres) reduction of suitable unoccupied habitat within the Fourmile project area, a 1.4% (1,338 acres) increase of suitable unoccupied habitat in ER/FL RD, and a 2.2% (3,626 acres) increase of suitable unoccupied habitat in the Nicolet land base (see Table 36).

There is a 3.4% (371 acres) reduction of suitable unoccupied habitat in the Fourmile project area immediately following treatment in 2023. Most of this can be attributed to the selection harvests in the Argonne Experimental Forest (330 acres) that reduce canopy closure to 75%. The canopy in these stands recovers within five years and the habitat becomes suitable by 2028. Five years following treatment in 2028 there is a 42-acre reduction in suitable unoccupied habitat in the Fourmile project area. This is due to even aged treatments that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

In 2023, immediately following treatment, suitable unoccupied habitat in the ER/FL RD increases by 0.3% (281 acres). This is a result of short-term (≤ five years) losses from treatments in several project areas in the ER/FL RD including Fourmile (330 acres), Grubhoe (92 acres), Morgan Lake (234 acres), and Northwest Howell (300 acres), coupled with ingrowth from past projects in the ER/FL RD including Long Rail (1,336 acres) and other untreated and non-project and areas. By 2028, the canopy in these stands have recovered and the habitat becomes suitable again. The recovery of these stands results in a 1.4% (1,338 acres) increase in suitable unoccupied habitat in the ER/FL RD by 2028. Ingrowth of a stand occurs when the stand meets the minimum age required by a particular species, according to habitat models. For

American ginseng when a stand of the appropriate forest type reaches 50 years of age, it is considered suitable habitat.

Immediately following treatment in 2023, there is a 0.0% (27 acres) reduction of suitable unoccupied habitat in the Nicolet land base. This is a result of short-term (≤ five years) losses in habitat resulting from treatments occurring in the Fourmile (330 acres), Grubhoe (92 acres), Morgan Lake (234 acres), and Northwest Howell (300 acres) project areas in the ER/FL RD and Honey Creek-Padus (1,074 acres) and Townsend (1,427 acres) in the LK/LA RD, coupled with ingrowth from the Long Rail (1,336 acres) project area in the ER/FL RD and Boulder (429 acres) and McCaslin (1,735 acres) in the LK/LA RD. By 2028, the canopy in these stands have recovered resulting in the habitat to become suitable and a 2.2% (3,626 acres) increase in suitable unoccupied habitat, primarily as a result of this ingrowth, or new habitat becoming available.

Immediately following treatment in 2023 there is a -0.4% and -0.2% difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 in the ER/FL RD and Nicolet land Base, respectively. This equates to a 378-acre difference at both scales that can be attributed to the proposed treatments in Alternative 2, of which 337 acres will recover within five years and become suitable habitat. Five years following treatment in 2028 there is a 42-acre difference in suitable unoccupied habitat between Alternative 1 and Alternative 2 at all scales (Fourmile project area, ER/FL RD and Nicolet land base). This can be attributed to proposed even aged treatments in the Fourmile project area that cause habitat to become unsuitable for the long-term (≥ 50 years). However, site index and common stand exam surveys, suggest these stands are not suitable for northern hardwoods should not be considered suitable habitat.

Conclusion

Direct effects to American ginseng occurrences would be minimized due to design features. Direct effects to habitat occurs in the form of a short-term (≤ five years) reduction (408 acres) in occupied habitat within the Argonne Experimental Forest. Within five years those impacts are expected to have dissipated and the area of occupied habitat would return to pre-harvest levels. There would be a short-term (≤ five years) reduction (330 acres) in suitable unoccupied habitat in the Fourmile project area. Within five years those impacts are expected to have dissipated and the area of suitable unoccupied habitat would return to pre-harvest levels. 2,330 acres of suitable unoccupied habitat would not be harvested during frozen ground conditions, putting undiscovered sites at a higher risk of impact from mechanical disturbance. Following treatment there is a 0.3% increase and 0.0% decrease in unoccupied suitable habitat at the ER/FL RD and Nicolet land base scales, respectively. Within five years those impacts would be expected to have dissipated and the area of suitable unoccupied habitat increases by 1.4% and 2.2%, in the ER/FL RD and Nicolet land base respectively, resulting from ingrowth.

Determination: May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Project Design Features for RFSS Plants

Activities which could disturb little goblin moonwort (*Botrychium mormo*) plants, their habitat, or microhabitat should not occur within 250 feet of little goblin moonwort populations. The extent of little goblin moonwort populations will be determined by a Botanist, Biologist, Ecologist, or other qualified observers (technicians or contractors) designated by a Botanist, Biologist, or Ecologist. No activity, no disturbance buffers may extend into unoccupied stands when an occurrence is adjacent to that stand.

In stands with known occurrences of little goblin moonwort (*Botrychium mormo*) site disturbing activities should only occur during frozen ground conditions. The frozen ground harvest restriction will be extended to unoccupied stands when the no activity, no disturbance buffer extends into that stand.

Activities which could disturb bluntlobe grapefern (*Botrychium oneidense*) plants, their habitat, or microhabitat should not occur within 250 feet of bluntlobe grapefern populations. The extent of bluntlobe grapefern populations will be determined by a Botanist, Biologist, Ecologist, or other qualified observers (technicians or contractors) designated by a Botanist, Biologist, or Ecologist.

In stands with known occurrences of bluntlobe grapefern (*Botrychium oneidense*) site disturbing activities should only occur during frozen ground conditions.

Activities which could disturb American ginseng (*Panax quinquefolius*) plants, their habitat, or microhabitat should not occur within 100 feet of American ginseng populations in stands proposed for selection harvest

with canopy gaps or within 250 feet of American ginseng populations in stands proposed for selection harvest in the Argonne Experimental Forest. The extent of American ginseng populations will be determined by a Botanist, Biologist, Ecologist, or other qualified observers (technicians or contractors) designated by a Botanist, Biologist, or Ecologist.

In stands with known occurrences of American ginseng (*Panax quinquefolius*) site disturbing activities should only occur during frozen ground conditions.

Any newly discovered RFSS plants located in treatment areas will be buffered and avoided during project implementation.

Conclusion

There are no known occurrences of Mingan moonwort in the Fourmile project area. There are no direct effects to Mingan moonwort since there are no occupied stands in the Fourmile project area. The Fourmile project area contains suitable Mingan Moonwort habitat and it's probable there are occurrences within the project area. There is a short-term (≤ five years) reduction in suitable unoccupied habitat at all scales. Within five years the canopy recovers and those impacts have dissipated. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions. The proposed action may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for Mingan moonwort.

There are two occurrences of little goblin moonwort in the Fourmile project area in two stands; one occurrence is adjacent to a stand proposed for treatment. Direct effects to little goblin moonwort would be minimized due to design features therefore no direct effects. There is a short-term (≤ five years) reduction in suitable unoccupied habitat in the Fourmile project area and Nicolet land base. Within five years the canopy recovers and those impacts have dissipated. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions. The proposed action may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for little goblin moonwort.

There are two occurrences of bluntlobe grapefern in the Fourmile project area in two stands, one of which is proposed for treatment. Direct effects to bluntlobe grapefern occurrences would be minimized due to design features. There is a short-term (≤ five years) reduction in suitable unoccupied habitat in the Fourmile project area and Nicolet land base. Within five years the canopy recovers and those impacts have dissipated. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions. The proposed action may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for bluntlobe grapefern.

There is one occurrence of ternate grapefern in the Fourmile project area in one stand that is not proposed for treatment. Proposed treatments occur adjacent to occupied habitat. Direct effects to the ternate grapefern occurrence and occupied habitat would be minimized due to the design features therefore no direct or indirect effects. The proposed action will have no impact from project activities due to protection from project design features for ternate grapefern.

There is one spreading woodfern in the Fourmile project area in one stand that is not proposed for treatment. No project activities proposed within occupied habitat or suitable unoccupied habitat therefore no direct or indirect effect. The proposed action will have no impact due to no project activities within occupied or suitable occupied habitat for spreading woodfern.

There are no known occurrences of butternut in the Fourmile project area. There are no direct effects to butternut since there are no occupied stands in the Fourmile project area. The Fourmile project area contains suitable butternut habitat and it's probable there are occurrences within the project area. Forest Plan guidelines for protecting individual butternut trees and seed sources will be followed during project implementation and will not impact undiscovered trees or suitable unoccupied habitat therefore no indirect effects. The proposed action will have no impact from project activities due to protection from Forest Plan guidelines for butternut.

There are 18 American ginseng occurrences in the Fourmile project area in 11 stands, of which six are proposed for treatment. Direct effects to American ginseng plants are minimized due to design features. There is a short-term (≤ five years), direct impact to occupied habitat in stands proposed for treatment in the

Argonne Experimental Forest that will have dissipated within five years. There is a short-term (≤ five years) reduction in suitable unoccupied habitat in the Fourmile project area. Within five years the canopy recovers and those impacts have dissipated. Undiscovered sites are at a higher risk of impact from mechanical disturbance in stands not harvested during frozen ground conditions. The proposed action may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for American ginseng.

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